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THE
HARBOR PLAN OF CHICAGO

THE HARBOR PLAN
OF CHICAGO
GENERAL LOCATION
OF
PROPOSED IMPROVEMENTS
CHICAGO
N
L A K E
PORTER

THE HARBOR PLAN OF CHICAGO

GENERAL LOCATION OF PROPOSED IMPROVEMENTS

LEGEND FOR WATERWAYS
- IMPROVED
- UNDER IMPROVEMENT
- PROPOSED
- NOT TO BE IMPROVED

0 1 2 3 4 5 6 7 8 9 10
STATUTE MILES

N

DUPAGE

COOK

WILL

LAKE MICHIGAN

LAKE

PORTER

EVANSTON

NORTH SHORE CANAL

DES PLAINES RIVER

CHICAGO RIVER

(EXISTING) CHICAGO

PASSENGER AND EXPRESS CARGO LAKE TERMINALS (PROPOSED)

PROPOSED CENTRAL AIRPORT.

CRAWFORD AVENUE PASSENGER AND PACKAGE FREIGHT BARGE TERMINALS (PROPOSED)

CHICAGO DRAINAGE CANAL

DES PLAINES RIVER

CALUMET SAG CHANNEL

LAKE CALUMET INDUSTRIAL BARGE TERMINALS (PROPOSED)

CALUMET RIVER

CALUMET INTERSTATE HARBOR
GENERAL COMMERCIAL AND INDUSTRIAL LAKE TERMINALS (PROPOSED)

WOLF LAKE

INDIANA HARBOR (EXISTING)

INDIANA HARBOR CANAL

BUFFINGTON HARBOR (EXISTING)

GARY (EXISTING)

GRAND CALUMET RIVER

LITTLE CALUMET RIVER

LOCKPORT

JOLIET

RAILROAD INTERCHANGE BARGE TERMINALS (PROPOSED)

ILLINOIS INDIANA

THE HARBOR PLAN OF CHICAGO

By

Committee on Chicago Harbor and Port Survey
COMMERCIAL CLUB OF CHICAGO

1927

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FOREWORD

Make no little plans; they have no magic to stir men's blood, and probably themselves will not be realized. Make big plans; aim high in hope and work, remembering that a noble, logical diagram once recorded will never die, but long after we are gone will be a living thing, asserting itself with ever growing insistency. Remember that our sons and grandsons are going to do things that would stagger us. Let your watchword be order and your beacon beauty.

DANIEL H. BURNHAM

PREFACE

During the past twenty-five years many estimates and reports have been presented by engineers, special commissions, and other organizations, giving facts and figures as to Chicago's needs in order to meet the requirements of her growing population and commerce.

Time, however, has proven that the most optimistic of these reports have been underestimates.

Chicago's expansion in commerce and transportation, in the arts and sciences, has been phenomenal. Her population has increased beyond the most sanguine expectations of her citizens.

There are many civic problems to be solved, and our public officials, commissions and civic organizations are all striving their utmost to be helpful.

Since the organization of the Chicago Plan Commission, the members of the Commercial Club have felt a deep interest in the preparation of a plan for harbor facilities. The wonderful and continuous development of the city since the preparation of the Chicago Plan has convinced them of the wisdom of the policy, originally suggested by themselves, of preparing in advance comprehensive plans for city development, anticipating the ultimate needs of the future and at the same time providing, step by step, for the necessities of the present, all in orderly progression. The experiences of the past seventeen years have certainly demonstrated that such a course conduces to economy, ministers to the comfort of the people, and serves the needs of commerce, while at the same time it establishes the beauty and dignity of the city.

The gradual realization of the pictures originally painted by Daniel H. Burnham, and published in 1909, gives to every citizen of Chicago a new thrill of pride. The pursuit of the ideal in this great effort has brought us also great and ever increasing practical benefits. The Commercial Club cherishes the devotion of its fellow member Charles H. Wacker to the ideals of artists as set forth in the Plan. His energy, persistence and practical wisdom have largely directed the titanic work of translating into realities these dreams of utilitarian beauty.

The adoption of the Plan by the people of Chicago and their patient, persistent pursuit of the fixed policy of realizing its benefits proves that the "Chicago spirit" so much lauded in 1893 still survives.

We can say today as Daniel H. Burnham said in 1909, "This spirit still exists; it finds the men; it makes the occasion; it attracts the sincere and unselfish; it vitalizes the organization and impels it to reach heights not believed possible of attainment. It seems to gather force with the years and the opportunities. It is even now impelling us to larger and better achievements for the public good. It conceals no private purpose, no hidden ends. This spirit—the spirit of Chicago—is our greatest asset. It is

not merely civic pride; it is rather the constant, steady determination to bring about the very best conditions of city life for all the people, with full knowledge that what we as a people decide to do in the public interest we can and surely will bring to pass." The adoption of a definite, comprehensive scheme of development not only sustains and stimulates such a civic spirit but prevents it from expending itself in ill-considered enterprises.

The location and arrangement of harbor facilities, the provisions for the transfer of freight and passengers from land to water agencies of transportation, and the distribution of commodities over city streets and roads with due regard to the probable future transportation by air, is at the very heart of the problem of city planning. Only by careful planning made long in advance for a completed system can the inexorable demands of Commerce in these respects be fulfilled without the sacrifice of beauty.

It must not be supposed that the importance of this matter was overlooked in earlier days. Almost the first sentence of the formal announcement of the Plan of Chicago was as follows: "The plan frankly takes into consideration the fact that the American city, and Chicago, preeminently, is a center of industry and traffic. Therefore, attention is given to the betterment of commercial facilities; to methods of transporation for persons and goods; to removing the obstacles which prevent or obstruct circulation; and to the increase of convenience." A subject of such importance was by no means ignored by the creators of the Plan. But the time was not propitious for the perfecting of a comprehensive harbor plan. At that time only five per cent of the freight traffic of Chicago was done by water, and it was the opinion of merchants and manufacturers that this proportion would not increase. Suggestions of permanent value were made at that time and are incorporated in this report.

However, the imminent prospect of freight movement along the Illinois Lakes-to-the-Gulf Waterway, and the solid hope for the opening of the St. Lawrence-Great Lakes Waterway at no very distant date, require at this time some re-adjustments and extensions of the plans proposed so long ago.

Almost continuously since the adoption of the Chicago Plan, the Commercial Club has had an active Committee appointed for the purpose of studying the general problem of the requirements, present and future, of business in Chicago for harbor facilities, and in recent years it has been realized that the subject is one of growing interest and importance.

The conditions under which it has undertaken the preparation of this Report may be stated briefly as follows: The City of Chicago applied to the Federal Government for permission to construct a movable bridge across the river at La Salle Street; the War Department withheld consent, and requested the city of Chicago to appoint a Port Commission to study and report upon all matters pertaining to the water port of Chicago.

This was done on December 3, 1924, and the permit for the La Salle Street bridge was then approved. This Commission, in order to determine the probable expense of an investigation, had a short preliminary report made by Major General W. M. Black, late Chief of Engineers of the United

States Army. Based on his report, a budget was prepared showing a requirement of about $50,000 to complete the survey. But this amount could not be spared from City funds. Under these circumstances the Commercial Club expressed its willingness to provide the necessary funds, and conduct this study, if invited to do so by the City. The City Council directed the Mayor to invite the Commercial Club to make this survey, which obligation the Club assumed and referred to a Committee, which has met at frequent intervals over a period of eighteen months and now presents its completed report.

The Committee, as its first and most important step, secured the valuable services of Major Rufus W. Putnam as its Engineer in charge of the technical work of preparing statistics, stating the problems and explaining the solutions arrived at after full discussion. The other chapters of this report are the report of Major Putnam. He in turn secured a competent staff of assistants and under his supervision the work has been accomplished within the time allotted and at about the estimated expense. The Committee feels that an acknowledgement is due from them to Major Putnam for his unfailing courtesy, care in investigation, fertility in suggestions, and accuracy in formulating the decisions reached by himself and the Committee.

Vast expenditures are being made for the completion of two great waterway systems of transportation, both of which have one terminus in Chicago. When these waterway systems are completed, Chicago will be the focal point where the deep sea traffic from the East by way of the Great Lakes, meets the greatest railroad center as well as the water artery across the low divide leading into the productive Mississippi Valley, and, eventually, to another deep sea port at New Orleans. There is an opportunity now, before the final completion of these projects, to lay out in Chicago the harbor facilities for both kinds of water-borne traffic with suitable arrangements for transfer, one to the other. The commerce which is destined to move over these routes must not be delayed by any lack of preparation on the part of Chicago. Plans must be adopted and put in the

Municipal Pier—Chicago

course of construction before private enterprise has gone so far with disconnected developments as to interfere with or perhaps greatly delay the construction of connected and well considered harbors.

During its studies of many months, the Committee learned that one harbor, on or near Lake Michigan, with the usual piers and warehouses, cannot possibly serve all classes of water-borne traffic and commodities. Coal, iron ore, limestone, grain and similar bulk material can hardly be handled at the same piers or even in the same kind of harbor that receive fruits and small package goods which are perishable. Since Chicago's commerce is so diversified, Chicago's harbor facilities must be so designed and constructed as to fit the varied interests in their several localities.

Accordingly, the Committee first studied the trend of water-borne traffic in each major industry. This was done not by the Committee alone but in co-operation with the authorities and officials of those commercial institutions themselves, and from them accurate estimates of the future expected water traffic were computed. Acreage and dock space and connections with other means of transportation were then figured to take care of that expected traffic.

The commercial interest in water-borne traffic must not interfere with, nor fail to have adequate connections with the railroad, street and highway and aerial transportation systems. A harbor scheme which contemplates frequent and lengthy railway bridge openings and consequent delays to important movements of passengers and goods would not be satisfactory, nor would a plan which caused the frequent interruption to street and highway traffic, as in the Chicago River.

The Plan is so drawn as to make possible the erection of fixed and immovable bridges over the Chicago River and the drainage canal, so that whenever it becomes the policy of the City and the War Department to eliminate the movable bridges, there will be no new obstacle created by the Plan to that desirable adjustment.

As the study proceeded, it became more and more evident that spaces should be allotted where deep water vessels could meet and exchange products with shallow draft barges; that an arrangement should be made where the ocean and lake boats and barges could load and unload direct to and from railway cars and motor trucks; that basins should be available for assembling large barge fleets similar to railroad freight trains for ease in transporting them though the waterways; and finally, it was evident that such sites were comparatively few and their selection is actually predetermined by existing conditions which impel, if they do not actually dictate, their location. So logical must be each location and so sound its plan of development that there can be no real doubt as to its wisdom.

In the Plan as outlined in the engineering study which is part of this recommendation and which is supported by many maps, pages of facts, figures and data of all kinds, there is little of the spectacular, simply because each unit appears to be so logical that it is predetermined.

The Harbor Plan of Chicago as proposed by the Committee consists of five main projects, each of which has several stages of construction:

THE CHICAGO RIVER HARBOR

1. It is proposed to focus around Municipal Pier an intensified harbor development for lake and ocean-going vessels which furnish passenger and package freight service. Some modifications at this Pier are necessary to bring it into full usefulness and a pier similar in size is proposed on the south side of the Chicago River mouth when the necessity arises.

ILLINOIS WATERWAY BARGE TERMINAL

2. East and west of Cicero Avenue a barge terminal and warehouse facilities are proposed on the Main Drainage Canal, this being a central point for the entire City, especially central for commercial and industrial areas and readily accessible by rail and street connections.

LAKE CALUMET INDUSTRIAL BARGE HARBOR

3. The first unit of a barge harbor with slips for exchange of heavy bulk materials to the railroad trunk lines or directly to industries in the great Calumet industrial area, is proposed to be built at once, the first unit being about one-eighth of the total capacity in Lake Calumet. When necessary the Sag Canal, which connects this harbor with the Drainage Canal and Lakes-to-the-Gulf Waterway, is to be enlarged.

INTERSTATE OR STATE LINE HARBOR

4. A complete industrial and commercial harbor south of the mouth of the Calumet River is proposed to include piers, warehouses, elevators and industrial sites where inland and ocean-going vessels from the Great Lakes and from European ports may exchange freight with barges from New Orleans and the Mississippi and Illinois Waterways, and with the railway systems.

A DIRECT CONNECTION WITH THE INDIANA INDUSTRIAL AREA

5. The dredging of the Grand Calumet River from the Indiana Harbor Canal in East Chicago to the Little Calumet River in Chicago is proposed. From this fork west the Little Calumet has recently been dredged.

A study of the report will disclose the fact that adjustments of existing port facilities can be made to meet the requirements of commerce for the present and for some years to come, without the expenditure of any very large sum of money. This fortunate condition is due to the fact that the Municipal Pier, already constructed, is an important part of the completed plan as proposed by the Committee, that the site for the barge terminal on the Drainage Canal is largely owned by the Sanitary District of Chicago, that the work of connecting the Lake Calumet Region with the Chicago Drainage Canal and Illinois Waterway has been undertaken and almost completed by the Sanitary District of Chicago, and that the City of Chicago controls a large portion of the property essential to the development of Lake Calumet.

The extension of the system as outlined in this report would call for the expenditure of very large sums of money, but only in case there is a

very large development of commerce due to the completion of the new waterway systems. These large expenditures would be made when there is a large growth of business, and it is, perhaps, a chief advantage of adopting a definite plan of this nature that the greater part of the improvements may be made step by step with the growth of the business demand for it.

Throughout this report will be found statistics of the water traffic of Chicago and estimates based upon all available data as to the future development of business, and at each one of these locations the facilities can be so expanded as to meet all reasonable future requirements. The expenditures which ought to be made in each of these localities to meet the requirements of the immediate future are carefully set forth. The manner in which the facilities thus established may be extended to meet the ultimate demands is fully explained.

Throughout the study, in connection with the facilities described, careful attention has been paid to the matter of highways, railway connections, etc., so that on completion of the initial steps in the program there can be made deliveries and transfers of all freight coming by water for local consumption or transfer to all transportation agencies in Chicago.

To avoid possible disagreements between conflicting jurisdictions in administering the affairs of the Port of Chicago, it is recommended that a local Port Authority be created by the General Assemblies of the states of Illinois and Indiana which would have such powers conferred upon it as to insure proper construction, maintenance and operation of the entire port facilities contemplated in this report.

In making this recommendation the Committee realizes that considerable time may be required to bring about the organization of a Port Authority. This need not, however, delay progress with the essential preliminary features of the physical plan for there is much that can be done by the City of Chicago itself under the legal limitations which now exist. Insofar as the present legal and financial conditions will permit, the consummation of the Harbor Plan should go forward, but at the same time steps ought to be taken to establish a competent Port Authority.

Respectfully submitted,

Wm. Rufus Abbott
Sewell L. Avery
Abel Davis
Samuel M. Felton
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John T. Pirie
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Rufus C. Dawes, Chairman

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I.

INTRODUCTION

On December 3, 1924, the Council of the City of Chicago created a Port Commission in response to a suggestion from the War Department that a thorough study of all problems affecting the interests of the Port of Chicago was advisable. In order to determine the probable expense of an investigation this Commission had a short preliminary report made by Major General W. M. Black, late Chief of Engineers, of the United States Army. Based on his report a budget was prepared covering the work to be done, showing a requirement of about $50,000 to complete the survey in the year 1926. This amount, however, could not be spared for this purpose from City funds.

Wishing to continue its contribution to the general improvement of the City of Chicago, in a manner similar to and commensurate with its former work and realizing the importance of the problem and that it is one which could best be solved by an impartial group of citizens, the Commercial Club of Chicago expressed its willingness to raise the necessary funds and conduct this study, if invited to do so by the City. The invitation to make this investigation was extended by the City Council to the Commercial Club in the following letter from Honorable William E. Dever, Mayor, to Mr. Rufus C. Dawes, President, Commercial Club of Chicago:

CITY OF CHICAGO

January 20, 1926.

Mr. Rufus C. Dawes,
President, Commercial Club of Chicago,
38 South Dearborn Street,
Chicago, Illinois.

My dear Mr. Dawes:

I am enclosing herewith copy of our Council proceedings of January 6, 1926 in which you will note the disposition of a resolution in which I am authorized to appont a Committee to consist of the Commissioner of Public Works, Corporation Counsel, Chairman of the Committee on Harbors, Wharves and Bridges, Chairman of the Committee on Finance, Chairman of the Committee on Railway Terminals and Chairman of the Committee on Local Industries, Streets and Alleys, of the City Council, to co-operate with your organization in the study of the terminal needs of the Port of the City of Chicago.

May I take this opportunity to express the appreciation of the present City Administration of your generous and public-spirited proposal to aid us in this very important harbor development.

The present financial condition of the City renders it difficult, if not quite impossible, for the City to undertake this work at the present time, hence our appreciation of the value of the splendid opportunity offered us, by the co-operation of your organization, to do something of substantial service to the City.

Yours very truly,
(Signed) William E. Dever,
Mayor.

The resolution adopted by the City Council January 6, 1926 and submitted with Mayor Dever's letter, is as follows:

"WHEREAS, There exists an emergent need of a thorough and careful study of the Port of Chicago and its terminal needs; and

WHEREAS, The Port Commission, created by ordinance passed December 3, 1924, finds that the financial condition of the City does not warrant the addition of the necessary amount to the appropriation for 1926; and

WHEREAS, The Commercial Club of Chicago, through its Executive Committee, has expressed its willingness to raise the necessary funds to conduct this study and make such recommendations as are proven wise and necessary, by this study, to the City Council of the City of Chicago; now, therefore, be it

RESOLVED, That the Commercial Club of Chicago be invited to proceed with this work and to present to the City Council such recommendations as are shown by the study to be urgently needed for the present, and a plan for the future development; and, be it further

RESOLVED, That in order to secure co-operation on the part of the City with the Commercial Club the Mayor appoint a committee, consisting of the Commissioner of Public Works, the Corporation Counsel, the Chairman of the Committee on Harbors, Wharves and Bridges, Chairman of the Committee on Finance, Chairman of the Committee on Railway Terminals, and Chairman of the Committee on Local Industries, Streets and Alleys to act as a means for such co-operation."

A fund of approximately $50,000 was subscribed by members of the Commercial Club for this purpose. The work was started July 1, 1926, and has been carried to completion under the direction of the Committee on Chicago Harbor and Port Survey of the Commercial Club by the following staff:

MAJOR RUFUS W. PUTNAM, formerly U. S. District Engineer in Chicago, in charge.

V. K. HENDRICKS, former Assistant Chief Engineer, St. Louis & San Francisco R. R., Railroad Engineer.

E. J. KOZLIK, Engineer of Design.

OSCAR ROMEL, Statistician and Economist.

ALICE M. DOYLE, Secretary

II.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

PORT FACILITIES

THE fundamental purpose of a port is to facilitate the transference of passengers and cargo between land carriers and water carriers. In accomplishing this purpose it is therefore desirable to bring the land and water highways to a common point of convergence, for much lost time and additional expense are involved if it is necessary to employ intermediate transfer agencies.

Service of the least flexible class of carrier generally governs in the location and general layout of a terminal. In a port, ships are by far the largest carriers and the most difficult to accommodate, hence the desirability of selecting locations which are easily reached from the open lake, and of insuring that every effort is made to expedite the turn-around of ships. This can be done by making each of the several harbor developments complete in all aspects so that a ship may obtain full service in one place, and if possible, at one berthing. This involves, principally, the provision of adequate rail, street, and barge waterway connections at each harbor site.

The execution of a comprehensive port development is a comparatively simple matter where there is little or no occupation by the various activities which are requisite to modern civic life, but it is rarely the case, given such freedom in matters of location and design, that there is need for port development of any magnitude, for one of the important fundamental factors upon which the supremacy of a port depends is missing; namely, a large tributary commerce.

While this general theory is usually applied to a large hinterland, it is equally true with regard to a smaller region such as the Chicago Metropolitan District. The localities in greatest need of port facilities are usually those where congestion is the most severe, and while it is entirely possible to plan and build port developments in isolated locations they would in all probability lie idle for many years to come unless they fulfilled some special mission other than the general service of the entire region.

This situation at Chicago has led to difficulties in the past, for the attempt to maintain a major port development in the heart of the city has caused continual conflict between opposing streams of traffic, i. e., between the water traffic on the Chicago River and the land traffic on the bridges over the river. The condition has been all the more serious because there were few interests in common between the land and the water traffic, and the toleration which generally creates a measure of relief where there are common interests has been entirely lacking in this case.

Needless to say the same situation is likely to obtain in the future wherever an inland port development is made in the Chicago Region. Land traffic is going to continue to increase and locations which now appear to involve little conflict between land and water traffic cannot be relied upon to enjoy the same degree of accessibility a generation hence.

A study of the trend of maritime affairs in the Chicago Region indicates a general upward movement in the receipt and shipment of raw materials, food supplies, and manufactured goods by water. There is no reason to believe that this trend will slacken. An investigation of the probable effect of the completion of the Illinois Waterway and of the St. Lawrence Waterway indicates that there will be a substantial increase in the use of water transportation in the Chicago Region. Port facilities therefore should be located and planned in such a way as to provide for indefinite expansion.

Considering the foregoing facts and reasoning it is concluded that all future major port developments for the service of ships should be located on the lake front, for only by so doing will it be possible to avoid the difficulties of the past and fulfill the requirements of the future. This principle applies to all classes of harbors for ships, i. e., commercial, industrial, and bulk interchange harbors.

With regard to commercial harbors for the general service of the Chicago Region the necessity of selecting locations where it is reasonably practicable to bring land and water highways to a common point, and the desirability of handling the greatest amount of local traffic with a minimum haul narrows the choice to a very few sites. These are:

At the mouth of the Chicago River;

On the lake front between 16th Street and 41st Street;

Near the old entrance to Wolf Lake, immediately southeast of the Illinois-Indiana interstate boundary.

A careful survey of the possibilities of each location develops that no one can be made to fulfill all requisites at reasonable expense. However, a solution combining a moderate addition to the facilities at the mouth of the Chicago River with provision for an extensive ultimate development on the lake front a mile north of the old entrance to Wolf Lake effects a compromise which seems to offer the greatest advantages and least disadvantages.

For industrial and bulk interchange harbor facilities for ships it appears that both the Calumet River and the Indiana Harbor Canal still have capacity in the way of industrial sites and unoccupied water front for some years to come. It develops, however, that questions of land traffic and channel capacity affect the problem of future use of these two harbors in such a way as to make it unwise to consider them as potential industrial and bulk interchange harbors indefinitely. Like the general commercial harbor, the ultimate development of industrial and bulk interchange harbors for the service of ships must be on the lake front, at a location where all lines of communication may converge, and where there is room for indefinite expansion.

The completion of the Illinois Waterway within the next five years will result in a demand for terminal facilities for the service of barges.

As in the case with ships these facilities will be in two categories, i. e., commercial, and industrial and bulk interchange.

For efficient use by local interests the commercial barge terminal must be as near the heart of the metropolitan district as the various factors influencing location will permit. Questions of bridge interference, railroad service, capacity of site, and access to ship harbors, all have their effect on the selection of the most desirable location and arrangement, however.

The Chicago River and the Calumet River have considerable capacity for industrial and bulk interchange traffic in barges, though, as in the case with ships, the channel dimensions fix the upper limits of capacity, rather than length of water front or area of industrial sites. Consequently recourse must be had eventually to new locations where this factor may be overcome.

All locations accessible to and used by ships should also be reached by barges in order that the general requirement be fulfilled that ship harbor facilities be common meeting points of all lines of communication. River barges are of a type of construction that does not permit them to navigate the open lake, hence protected passages close to shore or interior routes will be required.

COMMERCIAL HARBOR FACILITIES—SHIPS

(1) Lake passenger and package freight vessels, and ultimately, such ocean liners as may utilize the proposed St. Lawrence Waterway, will be served at the mouth of the Chicago River at the Municipal Pier and at an additional pier to be constructed parallel with and about 1800 feet south of the Municipal Pier; railroad connections with the Illinois Central R. R. and the Chicago and Northwestern R. R.; tunnel connection with the Chicago Tunnel Company; and street access from both sides of the river.

(2) Ships carrying general cargo that ultimately may not find accommodation near the mouth of the Chicago River will be served at an interstate harbor on the lake front south of Calumet Park; rail connections to the Elgin, Joliet and Eastern R. R., the Indiana Harbor Belt R. R.; the Belt R. R. of Chicago, and others; street connections to Indianapolis Boulevard via 102nd, 100th, 99th, and 98th Streets.

The Chicago Harbor of the Future

INDUSTRIAL AND BULK INTERCHANGE FACILITIES—SHIPS

(1) Locations on the Calumet River and the Indiana Harbor Canal should be utilized as long as channel capacity will permit.

(2) Ultimately additional traffic of this character will be accommodated at a harbor development on the lake front opposite the old entrance to Wolf Lake. There rail connections will be available, by means of a harbor railroad system, to the Elgin, Joliet and Eastern R. R., the Indiana Harbor Belt R. R., the Belt R. R. of Chicago, and others.

COMMERCIAL HARBOR FACILITIES—BARGES

(1) Barges to and from points on the Lakes-to-the-Gulf Waterway and connecting channels and carrying general package freight will be accommodated at a commercial terminal on the Chicago Drainage Canal near Crawford Avenue; rail connection via the Belt R. R. of Chicago, the Illinois Northern R. R., and others to and from local industries and points to the north and east; waterway connection to the ships' harbor at the mouth of the Chicago River, also to the interstate harbor near Wolf Lake via the Calumet-Sag Canal, the Little Calumet River, and the Calumet River.

(2) When traffic in the Calumet Region is large enough to justify the expense a commercial barge terminal will be provided in Lake Calumet.

(3) If and when rail-barge interchange traffic in package freight to and from points to the north and east is of sufficient volume an interchange terminal will be provided in Lake Joliet, a few miles below Joliet on the improved Des Plaines River. There connection may be made with the Elgin, Joliet and Eastern R. R., and through it, with all railroads entering Chicago.

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ENTRANCE TO CALUMET RIVER—SOUTH CHICAGO

INDUSTRIAL AND BULK INTERCHANGE FACILITIES—BARGES

(1) Industries now located on the Calumet and Chicago Rivers will utilize barge transportation to a certain extent. Those on the Indiana Harbor Canal will be given the same opportunity by the widening, deepening and straightening of the Grand Calumet River.

(2) New industries desiring barge harbor facilities will be accommodated at sites to be provided in Lake Calumet, where rail connection will be provided to the Belt Railroad of Chicago, the Indiana Harbor Belt Railroad, and others.

(3) As the barge movement between the Main Drainage Canal and the Calumet District increases the Calumet-Sag Canal will be widened.

(4) When rail-barge interchange traffic in bulk freight to and from points to the north and east is of sufficient volume an interchange terminal will be provided in Lake Joliet as in the case with package freight.

MISCELLANEOUS

No recommendations are made herein for private projects or for those which are largely of local significance. The harbors at Racine, Kenosha, Waukegan, Buffington, Gary, and Michigan City are in this class. The solution of problems involving water traffic at these locations is more properly a function of those directly interested; their affairs enter into the general situation only insofar as they are able to handle a portion of the general flow of traffic. In this respect these local situations have been considered, but a more detailed investigation would be an intrusion into local affairs.

IMMEDIATE STEPS

It is recommended that early action be taken with reference to all of the improvements proposed at the mouth of the Chicago River with the exception of the construction of the additional pier, as there is now a need for adequate rail service, and furthermore, with the addition of the facilities suggested ships would be attracted away from river terminals and thus a certain amount of interference with land traffic would be eliminated.

It is recommended that steps be taken at once to acquire property, rights of way, and privileges essential to the construction of the commercial barge terminal on the Chicago Drainage Canal and to the industrial barge harbor in Lake Calumet, and that construction of the first unit at each location be undertaken in time for completion by the opening of the Illinois Waterway.

Recommendation is also made that the improvement of the Grand Calumet River between its confluence with the Little Calumet and its junction with the Indiana Harbor Canal be undertaken as soon as practicable; also that an agreement be reached with all authorities interested to the effect that all new bridges over the Main Drainage Canal, the Calumet-Sag Canal, the Little Calumet River between Blue Island and Lake Calumet, and the section of the Grand Calumet River to be improved, have a vertical clearance of at least 21 feet.

And it is finally recommended that the shore lands essential to the development of the interstate harbor on the lake front, and the easements and essential rights of way, be acquired at an early date.

FIXED BRIDGES

One of the controlling factors in the initiation of this investigation of port requirements for Chicago has been the desire of the city to take appropriate measures looking to the ultimate permanent closing of movable bridges over the Chicago River. The direct cost to the city for building, maintaining and operating movable instead of fixed bridges has been estimated to amount to $900,000 annually; future direct annual costs may be as great as $2,000,000. Indirect annual costs such as delays to land traffic have been estimated as amounting to $200,000; future costs of this character might exceed $800,000 annually.

It is probable that the city is justified in expending a considerable sum in overcoming these losses provided, in so doing, the actual damage occasioned riparian owners and navigation interests is not incommensurate with the benefits to be expected.

In a report made by the War Department to the Congress of the United States dated March 1, 1927 there were enumerated the various effects, beneficial and otherwise, of the closing of the bridges over the Chicago River. The following quotations are of particular interest here:

"Closing the bridges having ample clearance for barges, lighters, tugs, and car floats would have no adverse effect on the grain trade, all of which could be handled to better advantage on the Calumet River.

"The local traffic in lake-borne anthracite coal, averaging over 300,000 tons annually, would cease with the closing of the bridges. The margin over all-rail shipments is slight, however; too small to have any effect on the price to the consumer. The loss of this traffic is not considered serious.

"Interchange traffic in anthracite coal can be handled to better advantage on the Calumet River than on the Chicago River. No loss is expected to result to this business if the Chicago River bridges are closed.

"Lumber and binder twine will have to be transferred at a lake-front terminal and carried to or from existing terminals or points of receipt or shipment by truck or lighter. Overall costs of shipment will be increased, with possibly adverse results to the traffic.

"Interchange package freight can be handled to better advantage on the lake front, provided suitable rail connections to terminals are available. Local package freight is now largely handled at lake front terminals, so that no material damage will result to it if the river is closed.

"The lake traffic in sand and gravel will be kept out of the river, if the vessels now in use are to be retained in service, unless lightering or trucking from the lake front is resorted to. It is possible that carriers may be designed and put into service which may operate economically with limited headroom. In any event, the effect would be to increase the cost of these materials to the consumer.

"The lake passenger traffic will have to be handled from a lake-front terminal, but there is no reason to believe it can not be taken care of as efficiently there as at river terminals.

"Closing the river to masted vessels will have little or no effect on potential lake or ocean traffic, provided the few remaining harbor sites on the lake front are conserved for harbor purposes and developed as required.

Bridges Over The Chicago River

"The provision of adequate lake-front terminals will be of material benefit to potential lake and ocean commerce. The combined effect of closing the river to masted vessels and providing modern lake-front terminals should be beneficial to the interests of navigation as a whole."

The Harbor Plan recommended herein should have the result, as its provisions are put into effect, of reducing to a minimum the disadvantages of closing the river to masted vessels. With the main barge terminal located in the extreme western portion of the city there will be little occasion for the large package freight barges, which require 21 feet of headroom, to navigate the congested portions of the Chicago River. Unquestionably it will be much cheaper to lighter the small amount of package freight between points east of Crawford Avenue and the barge terminal than for the large barges to engage in retail collection and delivery.

Provision will be made for the handling of all lake package freight at lake front terminals, also for the delivery of partial cargoes of grain at the lake front terminals. Substitute elevator service for that now remaining on the Chicago River will be made available at the Interstate Harbor in the course of time. The necessity for package freighters and grain vessels on the Chicago River will therefore disappear.

It is therefore proper to state that the Chicago River will cease to be a factor as a location for water terminals for masted vessels as the measures herein recommended become accomplishments. Fixed bridges, while not a part of the Harbor Plan are one of its objectives, and the means suggested for making them possible are therefore all the more strongly urged.

AIRPORTS

The solution of a comprehensive program of airport development for the Chicago Region involves the construction of a central landing field, which, on account of the prohibitive costs attending its construction in partially built-up sections of the city, will have to be provided at some location on the lake front that does not interfere with superior uses of the limited areas available.

The harbor plan proposed herein does not contemplate the use of the submerged lands in Harbor District No. 3 between 16th and 31st Streets; nor do plans for the development of the South Park system involve this area. Accordingly it is recommended that a central airport be built lakeward of the park system and immediately south of 16th Street extended, with the reservation, however, that there be no hangars and shops at this location, only minor facilities for the accommodation of passengers and planes and for the temporary shelter of cargo.

PORT ADMINISTRATION

In view of the many local governing bodies having certain jurisdiction over public waters, with grants of power direct from the legislature of the State of Illinois, it appears desirable that the paramount local power over the use of public waters which, now or in the future, are likely to be of value for purposes of navigation, should be lodged in one central authority.

It seems to be the policy of the Federal Government to confine its activities to providing main channels and major works of harbor protection and to protecting public waters from encroachments which would interfere with the full use of such works of improvement.

In a few instances state governments have discharged the functions of local port authorities, either through one of the regular state departmental agencies or by means of special commissions, but this means of conducting the local affairs of a port seems to have been applied either where the locality was largely unable to finance the undertakings involved, or the interests of the State in public

waters were not being fully conserved. In Illinois the State's interests are well safeguarded through one agency, the Division of Waterways, Department of Purchases and Construction. With authority to finance, a local body should experience no difficulty in raising funds.

It therefore appears desirable that the port authority to be created be a local governing body with limited jurisdiction over the region commonly referred to as the Chicago Metropolitan District. The object of a port authority is the promotion of the maritime and commercial interests of the region over which it has jurisdiction. A broad conception of this object includes governmental and commercial activities of many kinds, representing a community of interest among political, business, industrial and port enterprises. The port authority should be so constituted as to reflect this community of interest, and partisan politics should play no part in its appointment.

The port administration should be authorized to finance its operations in such a way as to make it self supporting. Bonding power will be necessary; possibly, also, taxing power, but the latter should be avoided if practicable.

The general powers to be conferred by the state upon the port authority should be broad enough for it to function in its allotted field without too many restrictions to hamper the efficient conduct of business, yet in sufficient detail to insure a clear understanding of the limitations. For Chicago the purpose of powers to be granted seems to be the creation of an agency that can plan and execute projects involving all phases of the development and operation of ports and port facilities. This agency should be able to protect these projects from interference by the operations of others and it should be in a position to operate any or all of the elements that go to make a well equipped port.

The situation at Chicago is different from that of most ports in that the economic region of which the city is the focus includes parts of other states. Increased demand for port facilities will require the development of a harbor in Indiana. Statutory authority for the port administration to operate in another state therefore seems requisite.

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INDIANA HARBOR-WHITING IN THE BACKGROUND

III.

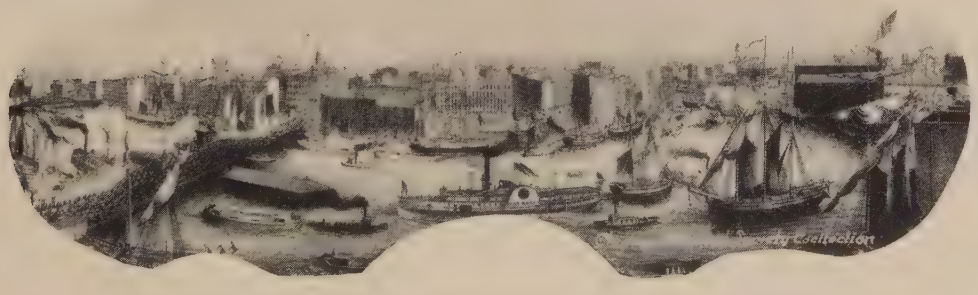
HISTORICAL

IN the early days in the history of Chicago the waterways were used in their natural state, little or no attempt being made to improve them. The first real step in the direction of improved facilities was the Act of Congress of March 2, 1827, granting to the State of Illinois certain public lands of the United States for the purpose of enabling the State authorities to finance and undertake the construction of the Illinois and Michigan Canal which was proposed to connect the Chicago River with the navigable portion of the Illinois River. The first contracts for the construction of this canal were June 6, 1836. Due to lack of funds construction was delayed from time to time so that it was not until the year 1848 that it was completed.

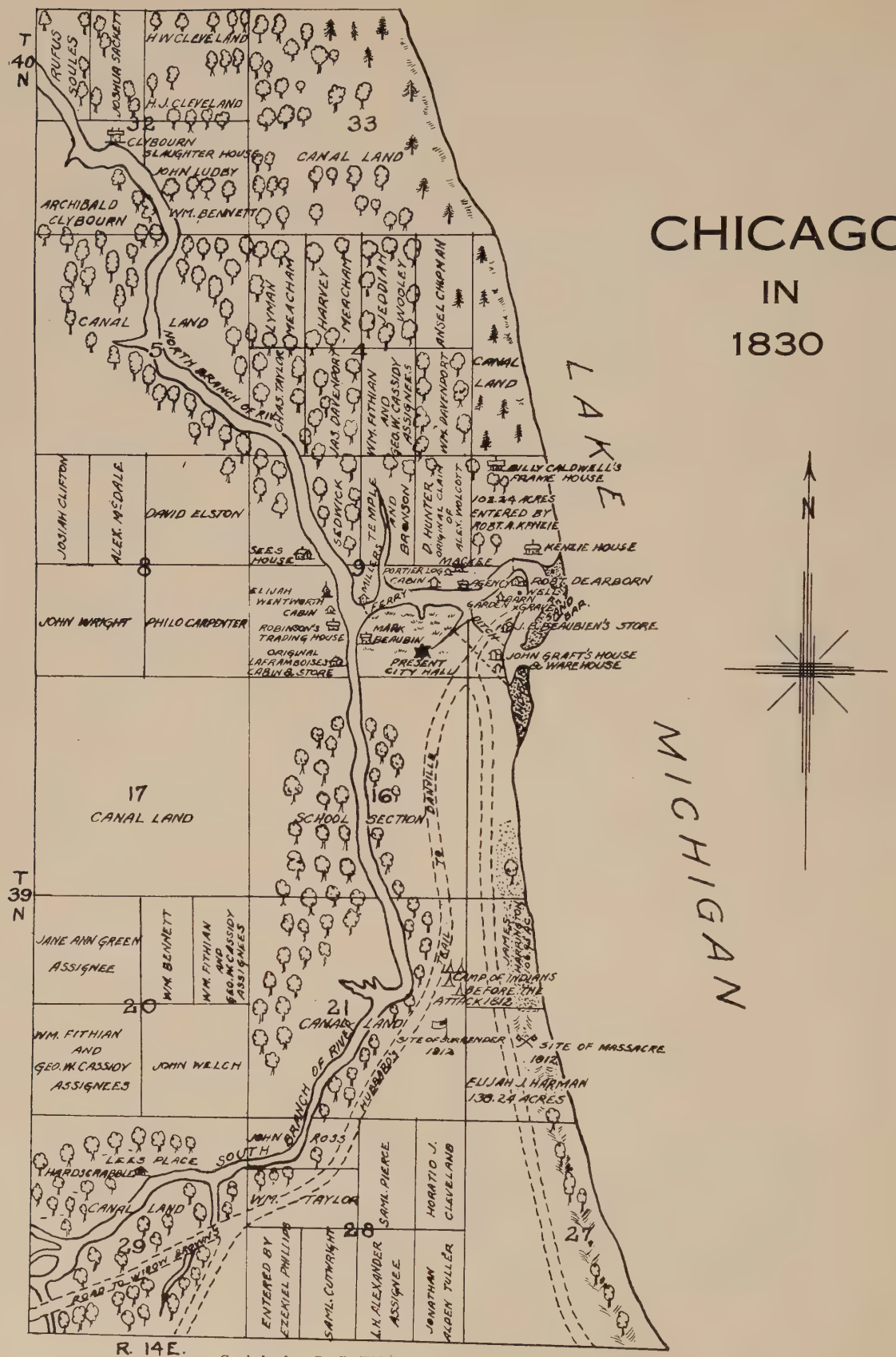
In later years four locks and dams on the Illinois River were completed, two by the State of Illinois and two by the Federal Government, so that a channel at least six feet deep was available between Chicago and St. Louis.

CHICAGO RIVER AND HARBOR

The Chicago River, instead of heading straight out into the lake as it does now, originally turned south about where Rush Street is now located and ran parallel to the lake shore before entering near what would now be Monroe Street extended. The first work of improvement was cutting through the bar, thus providing a straight outlet, and constructing a pier on the north bank. Later on, a pier was built on the south bank. There is no date of record of the beginning of any of this work. The United States Government extended the piers in 1836 or 1837 and at some later date the City of Chicago made an extension. Additions were made later on by the United States Government and the City to both piers until now they terminate some six to seven thousand feet from the mouth of the river as it existed in the thirties. In 1867, Mr. W. B. Ogden, president of the Chicago Canal and Dock Company, was authorized by the Secretary of War to construct a slip in connection with the proposed extension of the North Pier. This slip, known as the Ogden Slip, is in use to this day.



CHICAGO RIVER IN 1864—JUNCTION OF MAIN AND SOUTH BRANCHES



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By 1870 the commerce of the Port of Chicago had grown to such an extent that the river was totally inadequate as a harbor. On the 5th of June, 1869, 212 vessels reported at the port, while during the three summer months of that year the arrivals and departures totaled over 12,000. An anchorage basin on the lake front was necessary to accommodate vessels waiting to get to their docks on the river, and additional docks and slips on the lake front were urged. Congressional appropriations were finally obtained so that by 1880 the anchorage basin off the present location of Grant Park was dredged and enclosed by a breakwater.

In 1889 the exterior detached breakwater was built by the United States authorities to serve as a protection from storms from the north to vessels entering the harbor. With the completion of this breakwater Chicago's lake commerce began to assume large proportions and in the early nineties the number of arrivals and clearances at the Port of Chicago were not exceeded by any other port in the United States. At that time the total receipts and shipments averaged 10,000,000 tons per year.

Up to the early nineties, the improvement of the Chicago River was undertaken by the City of Chicago and riparian owners. The Federal Government had restricted its work to providing a safe and free entrance to the Chicago River. The river had been improved by dredging and by the construction of bulkheads and docks so as to provide a channel with a least depth of 15 feet and of varying width. As this depth did not compare favorably with that available in other lake harbors Congress was prevailed upon to provide funds for the improvement of the river by Federal agencies. A 16 foot project was entered into by the War Department in 1896 and completed in 1899, the depth at that time being limited by the height of the crowns of the tunnels under the river.

Subsequently the tunnels were lowered, and to meet the demands of vessels of the larger type a 21 foot project was adopted by the Federal Government in 1907 and completed in 1914. Simultaneously, the Sanitary District of Chicago, in providing a channel of adequate dimensions to permit the withdrawal of a large quantity of water from Lake Michigan to dilute the sewage of Chicago and divert it from the lake, widened, deepened and straightened the river from the Forks at Lake Street to the entrance to the Drainage Canal at Robey Street.

While all these improvements to the Chicago River were being made to make the stream a suitable harbor for vessels of the larger type, commerce steadily declined. From a maximum of eleven million tons in 1889 it had fallen to five million tons in 1907.

Local as well as Federal authorities viewed this diminishing commerce with concern and vigorous steps were taken to stem it. This decline coupled with the plans for park development along the lake front which threatened to prevent its use for harbor purposes led Mayor Busse, in a message to the Chicago City Council on January 6, 1908, to demand that steps be taken to revive the declining commerce and to reach some conclusions as to how far park development should be allowed to interfere with harbor facilities.

Chicago Harbor in 1893

The City Council promptly complied with the suggestions of Mayor Busse and directed the appointment of a Harbor Commission to investigate and report upon those matters. The Commission was duly appointed and in an able report published in 1909 recommended the development of an outer harbor immediately north of the entrance to the Chicago River. The harbor was to be so designed as to provide facilities for handling freight and passengers, replacing those on the river which were falling into disuse.

No immediate action was taken on the report of the Chicago Harbor Commission, but in 1911 a sub-committee of the Committee on Harbors, Wharves and Bridges of the City Council concurred in the recommendations of the Harbor Commission and in addition urged the establishment of Harbor Districts by the City of Chicago under authority contained in Section 1 of the Act of the General Assembly of Illinois, approved June 10, 1911, referred to as the Cities and Villages Act.

Simultaneously a detailed investigation of harbor facilities was made by the United States Engineer stationed at Chicago. The result of all these studies and reports was the construction of the Municipal Pier by the City of Chicago at a cost of approximately $4,000,000, completed in 1916, and the extension to the exterior breakwater by the Federal Government at a cost of $3,500,000 completed in the spring of 1923.

CALUMET RIVER AND HARBOR

As was the case with the Chicago River, the Calumet in its early state turned southward before entering the lake, having its outlet about 3200 feet south of the present location. The first work of improvement was executed by the Federal Government in 1870, the project being to cut through the intervening bar. This new outlet was protected by parallel piers extending out into the lake. By 1882 a safe entrance to the river was provided for vessels drawing 16 feet of water, and 4850 feet of pier had been constructed.

By an Act of Congress of August 2, 1882, the Federal Government assumed jurisdiction over the Calumet River. Congress subsequently appropriated funds and a 16 foot channel 200 feet in width as far south as Lake Calumet was completed. Some improvement work was done on the stretch between Lake Calumet and Hammond, but later this was abandoned. In 1896 work was begun on deepening the river to 21 feet for the accommodation of the larger lake vessels. The first two miles of the deeper channel were completed by 1898; this depth was extended to 122nd Street by 1908 and as far as Lake Calumet by 1912.

While those river improvements were in progress a safe entrance to the harbor and an anchorage basin were being provided by the construction of an outer breakwater, completed in 1904.

OTHER HARBOR IMPROVEMENTS

The improvement of harbor facilities in what is generally referred to as the Chicago Region has not been confined within the limits of the City of Chicago. Local harbors have been constructed at Racine and Kenosha, Wisconsin, Waukegan, Illinois and Michigan City, Indiana, each serving the territory adjacent to the terminals. The harbor at Gary, Indiana, is a private enterprise, constructed solely for the service of the Indiana Steel Company. At Buffington, Indiana, a harbor has just been completed which is being used in a similar way by the Universal Portland Cement Company. At Indiana Harbor, Indiana, the United States Government has provided outer harbor works to protect the entrance to an artificial waterway known as the Indiana Harbor Canal, which was built by private interests and turned over to the Federal Government to maintain as a public improvement.

IV.

REGIONAL PLANNING OF PORT DEVELOPMENT

DURING the time these various harbor and waterway improvements were being made the Federal Government has been the only authority which has considered them from a general point of view. The Federal Government's point of view is national, however; and quite properly so. In a way, strictly local interests have prospered as a result. Each local harbor development was made independently of the other; in a sense, some of them have been competitive.

In the early days of the history of the Chicago Region such a state of affairs was natural. Chicago was not large enough to be affected by the welfare of its neighbors or to exert much influence over their affairs, so when these improvements were initiated separately, they were made with little or no concern for their effects elsewhere. A certain amount of duplication of facilities has been the result, but also some decentralization.

It is only in recent years that the science of regional planning has come to the front, to take its place with city planning as a factor of great importance in modern life. City planners have learned that when a city has reached certain proportions it has become more than a self-contained and self-sufficient community, that it has a sphere of influence which is regional or perhaps national in extent.

This realization of the regional character of large cities has led to the gradual assumption of a regional point of view in the consideration of questions affecting the development of any important phase of city life. The adoption of this point of view makes it possible to further the tendency towards decentralization which local competition has started, and at the same time to eliminate wasteful and unnecessary duplication.

Artificial jurisdictional boundaries should bear no relation to the economic movement of goods or passengers through a region as highly developed as that around Chicago. That they do affect the situation is because the local point of view still prevails.

There has been conflict in the past when developments representing local needs have found opposed to them policies of conservation of interests of national concern. The Federal Government requires that streams such as the Chicago and Calumet rivers be kept open to lake traffic at considerable direct expense to the City of Chicago and indirect expense to individuals. Similarly, the City of Chicago has not been allowed a free hand in the execution of its program of beautification of the lake front on account of claims that potential harbor sites were being used for other purposes.

There are numerous instances of similar conflict between state and local interests.

It is felt, therefore, that any treatment given the general question of port facilities should be regional in its scope. A regional point of view should facilitate the adjustment of the national, state, and local interests; for a regional plan is not likely to get so far afield from any locality as to overlook or ignore its interests, yet it must reach forward and evaluate the national factors involved.

V.

PRELIMINARY ASSUMPTIONS

CHICAGO REGION

It is not easy to define the boundaries of an economic region no matter what basis is used for the purpose. More or less arbitrary assumptions have to be made when it comes to fixing them definitely even though the approximate locations may be fairly clear.

This study assumes that water terminal developments in the Chicago Region should be approximately within an economical trucking radius of the center of the City of Chicago, and therefore considers an irregularly shaped area from Racine, Wisconsin, on the north to Kankakee, Illinois, on the south, and from Michigan City, Indiana, on the east to Joliet and Aurora, Illinois, on the west. This area includes also all of the railroad belt lines serving the Chicago district.

LAKES-TO-THE-GULF WATERWAY

In order to predict future port requirements with any degree of accuracy definite assumptions are required as to future water routes and their probable characteristics. As far as the Lakes-to-the-Gulf Waterway is concerned these assumptions may be made fairly easily, for the most difficult part of the improvement (from Lockport to Utica) is now under construction, and the rest of the way will undoubtedly be made to conform in general to the dimensions being provided by the State of Illinois. Therefore, it is reasonable to assume that a least depth of 9 feet will be provided between Chicago and the Gulf of Mexico, and that the least width will be 200 feet except for the canals at Chicago, and for the few locks in the canalized rivers.

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LOCKPORT LOCK—ILLINOIS WATERWAY

It is more difficult to calculate the time element than to predict the least dimensions. The improvements now under way by the State of Illinois may take two years' time to complete; the structures remaining to be built may take as long as that after construction has been started. Some time is necessary for the acquisition of sites for structures, so that from three to four years may elapse before the improvement will be fully ready for use.

The portion of the Mississippi River between Grafton and Cairo, which will require deepening by the Federal Government to 9 feet, has not been authorized to be improved to that depth. Nothing can be done in this direction until Congress authorizes the work, and from three to four years will be required once the work has been started.

GREAT LAKES HARBORS AND WATERWAYS

It seems reasonable to assume that the more important harbors on the Great Lakes, the connecting channels, and the St. Lawrence River, will be improved ultimately so as to provide depths of 25 feet, possibly of 30 feet. The Welland Canal around Niagara Falls is now being rebuilt with depths of 30 feet in the locks and 25 feet in the canal. Congress has requested an investigation of the deepening of the harbors and connecting channels, and a special joint commission appointed by the governments of the United States and Canada has recently recommended the early improvement of the St. Lawrence River.

The rebuilding of the Welland Canal is progressing favorably and should be an accomplishment by 1930. Provided funds are available, the Great Lakes harbors and channels could be deepened to 25 feet within five years' time after the work is authorized. The same is true with regard to the improvement of the St. Lawrence River; but since this is an international question, the political preliminaries may delay the project.

For this reason, it has been deemed unwise to attempt to estimate the date of completion of the St. Lawrence Waterway, or an equivalent improvement. The investigations have been made and plans prepared in such a way as to insure the provision of adequate facilities regardless of the time element.

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MOTORSHIP "STEELMOTOR"

VI.

LOCATION AND DESIGN OF WATER TERMINALS

INTRODUCTORY

IT has been said that the supremacy of a port is largely dependent upon three factors: First, the tributary commerce, actual or potential; second, the size and accessibility of the harbor; third, the efficiency of its terminal facilities. The first factor requires a rich hinterland capable of supporting a large population and producing an excess of agricultural, mineral, or manufactured products, and is largely independent of the works of man. The other two factors, if not present in a particular place, may be provided by engineering and other works, so that if the primary requisite of a rich tributary area is available the extent to which supremacy may be attained by a port is measured by the care and thoroughness exercised in the design and layout of the harbor and its facilities.

Few ports, if any, have been built to order. In general, it is not possible to follow a set of standard specifications for the arrangement of even the important features of a port development. Three major influences seem to have guided the evolutionary processes which have characterized the growth of world ports. The first of these is best expressed by defining the fundamental purpose of a port, which is to facilitate the transfer of passengers and cargo between water and land carriers. Therefore, means which will ease that transfer are much to be desired, and their attainment is the motivating influence in the layout and design of a port.

The physical conditions which must be overcome constitute the second of these major influences. They affect largely the type of construction used, perhaps the kinds of transfer facilities, and in many cases the location and arrangement of the port.

Of possible equal importance in the planning of terminal developments are the characteristics of the stream of commerce for which provision must be made. The quantity and quality of trade have a distinct bearing upon many of the problems which have to be solved. For this reason the load characteristics of a port might be considered the third important influence.

While the motivating influence in port building is the same everywhere, the other two factors are not, for investigation shows that no two port situations are alike either as regards physical characteristics or load characteristics. For a specific problem, such as the one dealt with here, it is therefore advisable to consider various aspects of a number of situations, both abroad and in this country, which may be used to form a composite situation that will conform closely to local requirements.

THE LIVERPOOL LANDING STAGE

EUROPEAN SEAPORTS

Many important seaports in Europe have had the benefit of authoritative planning of their major features for at least the past twenty-five years; some of them, Liverpool for instance, have enjoyed this advantage for a much longer period. An investigation of the more important port projects in Europe therefore gives an indication of the relative advantages and disadvantages of centralized control of port affairs and at the same time shows the effectiveness of the means employed of overcoming the various physical restrictions which tend to limit the capacity of a port.

Of the many European seaports of relative importance that might be investigated those of Bordeaux, Marseilles, Hamburg, Antwerp, London and Liverpool are sufficiently representative of a variety of conditions for present purposes. Of these, Bordeaux has an autonomous administration created by authority of the national government; Marseilles' port affairs are governed by the Chamber of Commerce, which has been in active participation in such matters since 1839 and in full control since 1898. Hamburg has the equivalent of what would be called State control in the United States; Antwerp has a department of the city government as its port authority; while London and Liverpool operate under what are known as Harbor Trusts, composed of representatives of local business interests placed in office by a special electorate.

Marseilles is the only port with its harbor on the open sea; all the others are located on rivers. Bordeaux is 62 miles inland; Hamburg 85, Antwerp 54, London 50, and Liverpool only 15. Each of these river ports was located where the first land crossing was practicable, but it is curious and interesting to note that in spite of the great advance in the science of bridge building since the days when the first crude structures were thrown across these streams and determined the location of the ports, no bridges have been permitted to seaward.

General View of Royal Albert Dock—London

The necessity of building tidal basins and locks at enormous expense at some of these ports has resulted in an intensive use of both land and water area. At Marseilles the high cost of construction of piers and breakwaters in comparatively deep water has brought about the same condition of intensive use. In a selected year the port of Marseilles had a record of 13,875 tons of cargo per acre of harbor water area compared with an average of 4,660 tons for all the European ports selected, including Hamburg with 8,750 tons and Bordeaux with 2,900.

The bridges over the Rhine, the Elbe, the Thames and the Garonne have sufficient headroom to pass the barge traffic without opening.

Special effort has been made almost universally in the continent, and to a large extent in the modern installations in England, to develop highly efficient commercial port facilities. The extensive use of shore cranes at the pier sheds is most noteworthy, the latest examples showing as many as one crane to every 100 feet of pier. The semi-portal gantry crane seems to be the most popular type for general use, though there are many other favorites, depending upon local conditions as well as prejudices.

Inland waterway traffic is of considerable importance in most European ports, and is of such volume that special provision is made for it on rather a large scale. Marseilles has gone to great expense to facilitate the free entrance of barge traffic (which is still largely potential) to its port. At Hamburg, where the barge traffic with the interior exceeds that by rail, a considerable portion of the harbor is devoted to the service of barges exclusively, while two belt canals have been built around the ship harbor to permit the ready entrance of barges to the slips without their interfering with the movements of the larger vessels. Antwerp has no such arrangement with the result that its harbor is thoroughly congested. Universally the principle is applied of bringing the barge traffic to the ships where barge to ship interchange is involved, even though the barge harbor and ship harbor are widely separated.

Crane Equipment of Antwerp Piers

AMERICAN SEAPORTS

As a rule, American seaports have not been designed deliberately and built according to predetermined plans. A study of their characteristics will not give one an idea, by any direct method of reasoning, of what might be called prevailing practice on this continent with respect to the location and design of seaports. In many instances, the history of an American seaport shows that private exploitation of port facilities has not been restricted to any extent by other than economic influences. While a study of European practice can show the benefits of comprehensive port planning and building, an investigation of the American situation should give an idea of what is sound commercially.

For variety of conditions the ports of Montreal, Boston, New York, Philadelphia, Baltimore, Norfolk, New Orleans, Los Angeles, San Francisco and Seattle are sufficiently representative. By far the bulk of foreign and coastwise commerce of North America is handled through these seaports. Of these, one port has a federal administration, one an inter-state control, five have state port authorities, and three are governed by municipalities.

New Orleans, Baltimore, Philadelphia and Montreal are situated on rivers, 110, 190, 101 and 1,000 miles from the sea, respectively. New York, Norfolk and Seattle are on estuaries at the mouths of rivers, and are, respectively, 16, 40, and 125 miles from the ocean. Boston and San Francisco are on natural bays, while Los Angeles has an artificial harbor on San Pedro Bay. It is apparent that distance from the sea is no serious handicap; but this is true only because navigation is comparatively free from interference by natural or artificial obstacles in the intervening reaches. The tendency is for the port to seek a cross-roads of land highways, for by this means transfers of cargo and extra handlings are eliminated.

In every case the entrance channels have been kept as free from obstacles as possible. Channels to the commercial ports are universally kept clear. The commercial sections of all these ten ports are seaward of all bridges except for the high bridge over the St. Lawrence River at Quebec, the high bridges betwen Manhattan Island and Brooklyn over the East River, and the new high bridge over the Delaware River at Philadelphia.

There is no uniformity as to size and shape of these harbors. The physical characteristics at each place have a great deal to do with the type of development followed, and consequently the shape of the harbor and the relation of land to water area. Los Angeles gets along with 1700 acres of water surface, and does a large amount of business; New York has over 30,000 acres of water surface in its inner harbor, yet is woefully congested in places.

As previously stated, there are no low bridges over the main entrance channels leading to the

Cotton Warehouse, Port of New Orleans

arbors or between the commercial ports and the pen sea. However, there are several industrial ort developments between which and the open sea ere are one or more low bridges. At Boston the dustrial port facilities on the Charles and Mystic vers, and on the Fort Point Channel, are all upream of one or more bridges; the same is true on e Passaic, Hackensack and Harlem rivers in New ork Harbor, and of the Schuylkill River at Philaelphia.

Contrary to practice which is almost universal in urope, commercial port facilities in America are latively simple. One or two storied transit sheds ith little or no equipment for handling cargo beveen ship and pier are all that is provided in America. Some of the more modern sheds are equipped with elevators for transferring goods between floors, and they are practically all provided with railroad connections, by one or more lines of track along the aprons of the piers, or perhaps down the center driveways.

It is almost universally true in America that the choicest commercial piers are those nearest the commercial districts. At Montreal the transatlantic liners berth at the piers at the foot of the principal streets. In New York, Philadelphia, New Orleans, San Francisco and Seattle the situation is the same. At Boston, Baltimore, Norfolk and Los Angeles, the port developments are more largely industrial so that downtown piers are not so much in demand.

Curtis Bay Coal Terminal—Baltimore and Ohio R. R.

Entirely opposed to practice in handling cargo that seeks a commercial port are the means employed for handling bulk cargo. Mechanical appliances for handling coal, ore, building material, grain and other bulk goods are installed wherever there is a heavy movement of these commodities, and the equipment used is of the highest order of efficiency.

American ports, with the exception of New York, have been quite liberal in providing for physical connection of the railroads serving their hinterlands, and local switching districts as well, with the waterfront; the exception with regard to New York applies only to the piers on Manhattan Island. However, until comparatively recently the tendency was to serve one or more piers by single railroads, with little or no provision for interchange between competing piers and lines. The so-called "railroad ports" of Boston, Philadelphia, Baltimore and Norfolk operated under this sort of an arrangement for many years and it is only within the past few years that this practice has been partly broken up by the construction of publicly owned belt lines or the enforcement of switching arrangements.

Street connections to the waterfront universally suffer from lack of adequate planning of layout, size and use. Consequently congestion is the rule along the waterfronts, particularly those used for commercial port business. A commercial port development is a source of street traffic of considerable volume, and of sufficient importance to warrant special consideration in the preparation of general harbor plans.

Connections to interior waterways and the port facilities especially adapted and used for inland waterway traffic alone are "back door" affairs. They are located so as to be out of the way of the more important accommodations for ships and to keep the less expensive barge traffic from interfering with ship traffic. Where there is interchange between ships and barges, the latter universally go to the deep water facilities, alongside the ships wherever they may be; no attempt is made to carry deep water inland to the barge terminals to permit the ships to go there for interchange.

Bush Terminal Buildings, New York City

AMERICAN RIVERPORTS

Riverports might be grouped into two general classes: first, those where facilities for handling inland waterway traffic are provided in combination with those for the service of ships, such as New York, Buffalo, Philadelphia and New Orleans; second, those which have no ship traffic and consequently are arranged solely for the service of barges and other river craft. Among the latter are St. Louis, Memphis, Pittsburg and Cincinnati. It would appear that Chicago belongs to the first class, for there will be involved in its port arrangements facilities for serving both ships and barges.

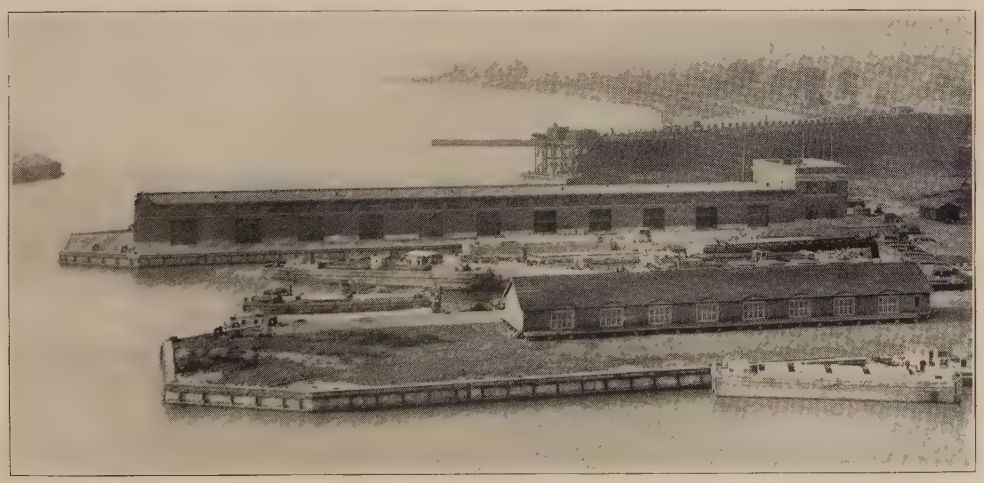
In this first class of terminals the service of ships predominates, the higher operating and investment costs of the larger carriers justifying greater attention to their requirements. In many cases terminals are designed and equipment provided for cargo handling which will answer the requirements of the ships to best advantage, and river craft are forced to accommodate themselves as best they may.

Only in recent years has an effort been made to give special service to this kind of water traffic at seaports or lakeports, and there are really only two notable examples of this tendency. At New York and at Buffalo, the State Barge Canal authorities have built special terminals for the accommodation of the barges that use the Hudson River and the state canals.

At Buffalo, for instance, an inner breakwater encloses a small barge harbor on the flank of the ship harbor, and a package freight terminal has been constructed on a pier in this inner harbor. Interchange of freight with rail and truck is amply provided for.

Elsewhere the river craft are required to utilize terminals which have been designed and located for the service of ships.

In the second class of riverports, i. e., those in the interior and not concerned with vessel traffic, the terminal facilities are found to meet the peculiarities of river craft to much better advantage. Not only have they been adjusted to the rise and fall of streams on which they are located, but special attention is being given to the best methods of getting the cargo in and out of the river craft with the least amount of damage and expense.



Terminal of New York State Barge Canal—Buffalo, New York

Municipal Barge Terminal—Baton Rouge, Louisiana

Municipal Barge Terminal—St Louis

AMERICAN LAKEPORTS

The characteristics of the commerce on the Great Lakes are so different from those of the trade at our seaports that it is desirable to consider them separately. Of the several hundred harbors on the Great Lakes those of Duluth-Superior, Milwaukee, Chicago-Calumet, Cleveland, Ashtabula and Buffalo are sufficiently representative for this purpose, for the major influences at work on the traffic situation on the Great Lakes exist in large measure in one or more of these ports.

The port of Duluth-Superior is the only one of the six considered which has a naturally protected harbor basin; all the others are artificially protected entrances to streams. This explains the comparatively extensive water area within the limits of this port. At the other harbors the ships of the early days sought refuge and accommodation some distance up the streams, which were widened, deepened and straightened to some extent to permit of proper use. The entrances were first protected by piers, then by exterior breakwaters, which were subsequently extended to the shores, forming exterior anchorage basins. As the rivers became congested and land traffic increased, efforts were made to locate the more important facilities on the lake front behind the breakwaters. This tendency has resulted in the location of many of the high duty facilities at a harbor, such as ore unloaders, coal-dumps and yards, on or near the lake front.

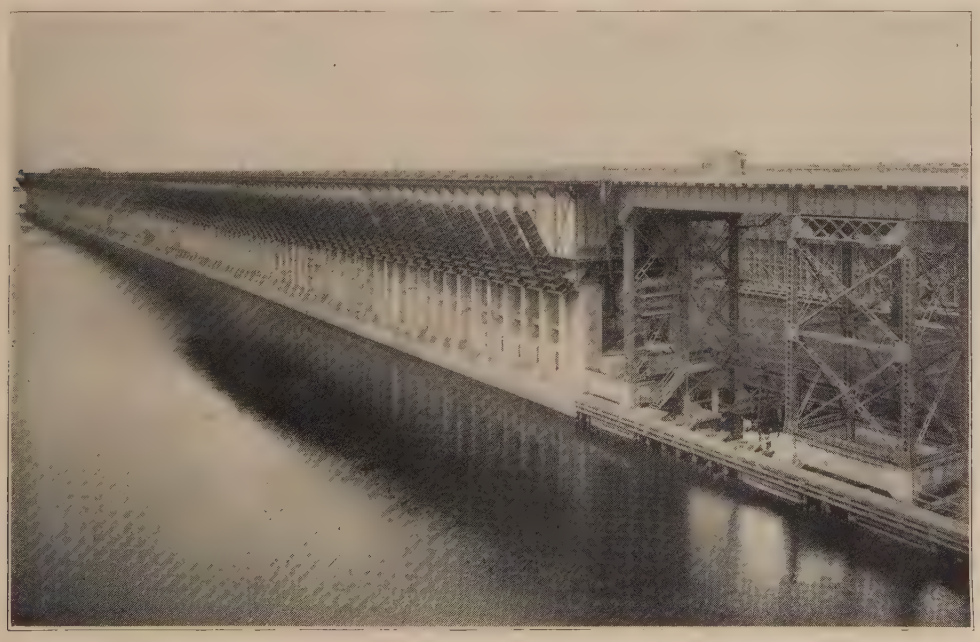
Except at Duluth-Superior, therefore, the present situation shows inner harbors on rivers, and anchorage basins outside the mouths of the streams and protected by breakwaters, parts of the protected area on the lake front being used for terminal purposes other than anchorage.

The ports on Lake Michigan have all year round navigation, but there is no inter-lake movement during the winter months.

These harbors have no serious problems resulting from fluctuation of water surface. There is no tide, and the cyclical rise and fall of the lakes, even though aggravated temporarily by seasonal and diurnal changes, is insufficient to require the use of wet docks or inclined approaches.

Fog conditions are the worst at the ports of Chicago and South Chicago, due, of course, to the immense amount of smoke which makes visibility worse than it otherwise would be. However, comparatively bad as fog conditions seem to be at the southern end of Lake Michigan, they have not prevented the extensive use of the harbors and channels there.

The traffic statistics show that the predominating movement on the lakes is of bulk cargo of which



Ore-Loading Dock of the Great Northern Railway Co.—Duluth-Superior

iron ore, coal, limestone, and grain comprise about 70%. For this reason it is to be expected that extensive and efficient facilities for handling cargoes of this character have been provided.

No standardized mechanical cargo handling devices are employed at terminals on the Great Lakes for the transfer of package freight between ship and shore. Most of the ships in the trade are equipped with side hatches only, an arrangement which does not lend itself well to mechanical conveyance. Furthermore, the trade does not warrant special packing to resist the wear and tear of mechanical handling.

Traffic on the Great Lakes is not of such character as to produce street congestion along the waterfronts. The bulk commodities are usually consumed where discharged, or rail and water interchange is involved. Exceptions to this are the local delivery coal yards at Milwaukee and Chicago, and also the building material yards where lumber, sand, gravel and stone are received by boat and distributed by truck or team.

Only two of these ports have inland waterway connections. Buffalo has the New York State Barge Canal, while Chicago has the Main Drainage Canal and the Sag Channel, both leading inland to the old

Coal Dumper of New York Central Railroad at Toledo

Illinois and Michigan Canal, and the Illinois Waterway now under construction. The barge terminal at Buffalo is on the lake front at the mouth of the Buffalo River. It has been provided with the auxiliary protection of an inner breakwater as the outer harbor is of sufficient extent to allow wave action to be produced which would interfere with, if not endanger, the service of barges at the terminal.

GENERAL PRINCIPLES

It is apparent from the foregoing consideration of situations elsewhere which have a bearing upon the location and design of water terminals that there are three groups of influences which are of major importance. These are:

a. Characteristics of water carriers and water routes.

b. Load characteristics.

c. Physical features of the terminal region.

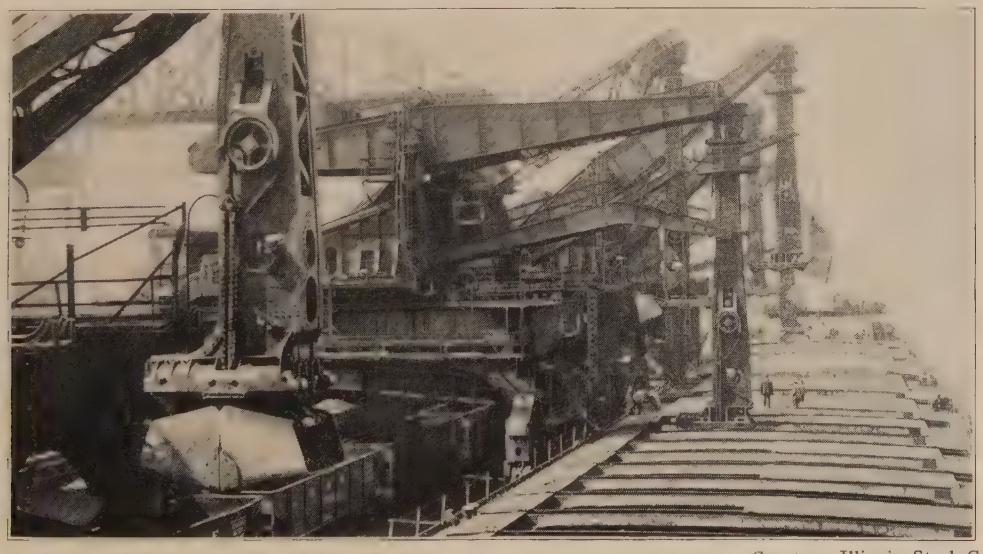
The solution of a terminal problem along sound lines requires, therefore, a careful evaluation of these three factors as applied to the locality in question.

It is no great handicap for a port to be located at some distance from the sea if the difficulties of navigation in the way of restricted channels are not too great.

It is not necessary that the harbor site be very extensive for with well arranged facilities a large volume of commerce may be handled in a comparatively limited area. A harbor site requires in the first instance protection from the open seas and from obstructive currents; secondly, ample area of sufficient depth for the anchorage of vessels awaiting dock space, quarantine service, or what not; third, area to permit the construction of shore facilities, such as piers, warehouses, storage yards, railroad yards, and rail and street connections. The location selected should be capable of expansion by the addition of units for a great many years.

There should be no obstacles such as bridges between the commercial harbor and the open sea; and as few of these as possible over the entrance to the industrial harbor. These bridges should be high enough over the water to permit the passage of tugs, lighters and barges without opening.

If there is a large amount of local traffic at a port its water terminal facilities should be located with special reference to easy pickup and delivery. If interchange or industrial freight predominates, then at least the facilities for handling these kinds of traffic should be located where these two purposes may be served to best advantage. It is practicable to have separate terminals for each of these



Courtesy Illinois Steel Co.

HULETT ORE UNLOADERS, GARY, INDIANA

classes of traffic, provided some provision is made at each place for handling the others. In this way it will be practicable to serve a ship at only one berthing.

Terminals for river craft should be located where there will be no interference with the service of ships, though it should be possible for the barges and lighters to come into the ship harbor and alongside the ships to interchange cargo.

Free, unrestricted and direct interchange of freight between all kinds of land and water carriers should be provided at all major terminal developments within a port.

VII.

THE CHICAGO REGION

GEOLOGY AND GEOGRAPHY

THE Chicago Region lies in the center of what is known geologically as the Central Lowland, the vast basin stretching from the Appalachian Highlands to the Rocky Mountains; it is on the divide between the watershed of the St. Lawrence and Mississippi rivers.

The topographical conditions prevailing in this region have been shaped largely by glacial action, glaciation having reached as far south as the Ozark Ridge in southern Illinois. As the ice melted glacial lakes developed, the most noted of which in Illinois was Lake Chicago whose surface was at a height of some 60 feet above the present level of Lake Michigan. The outlet of this lake, known as the Chicago Outlet, was by way of the Des Plaines River Valley; this formed a barrier as the waters receded, and Lake Michigan was formed.

Most of that portion of the Chicago Region with which this report is concerned is included in what is known geologically as the Lake Plain, an area that was once covered by Lake Chicago. On it are located all of the Lake Michigan cities in the region except for a stretch between Waukegan and Winnetka where the Lake Plain has been cut away by waves, leaving the so-called Lake Border Upland to form the rugged shore line of Lake Michigan.

The sand dunes, which rise to heights as great as two hundred feet along the lake front east of Gary, are also in the Lake Plain though their origin is comparatively recent.

Except for these dunes this Lake Plain is relatively flat and low, and it is characteristic of Lake Michigan that the foreshore opposite is of gentle slope, both conditions being favorable to carrying on extensive construction operations along the shore.

Several small streams drain this Lake Plain, chief among which are the Root River at Racine, Pike Creek at Kenosha, the Chicago River, the Calumet River, and Trail Creek at Michigan City. Each of these streams in its natural state is characterized by sluggish flow and low discharge.

Inland of the Lake Plain are successively what are known geologically as the Lake Border Upland, the Valparaiso Upland and the Outer Upland. These consist of a series of glacial moraines, and in the central part of the Chicago Region they are distinct from each other. The general topography of these belts of upland is characterized by parallel ridges of low relief producing a gently rolling surface.

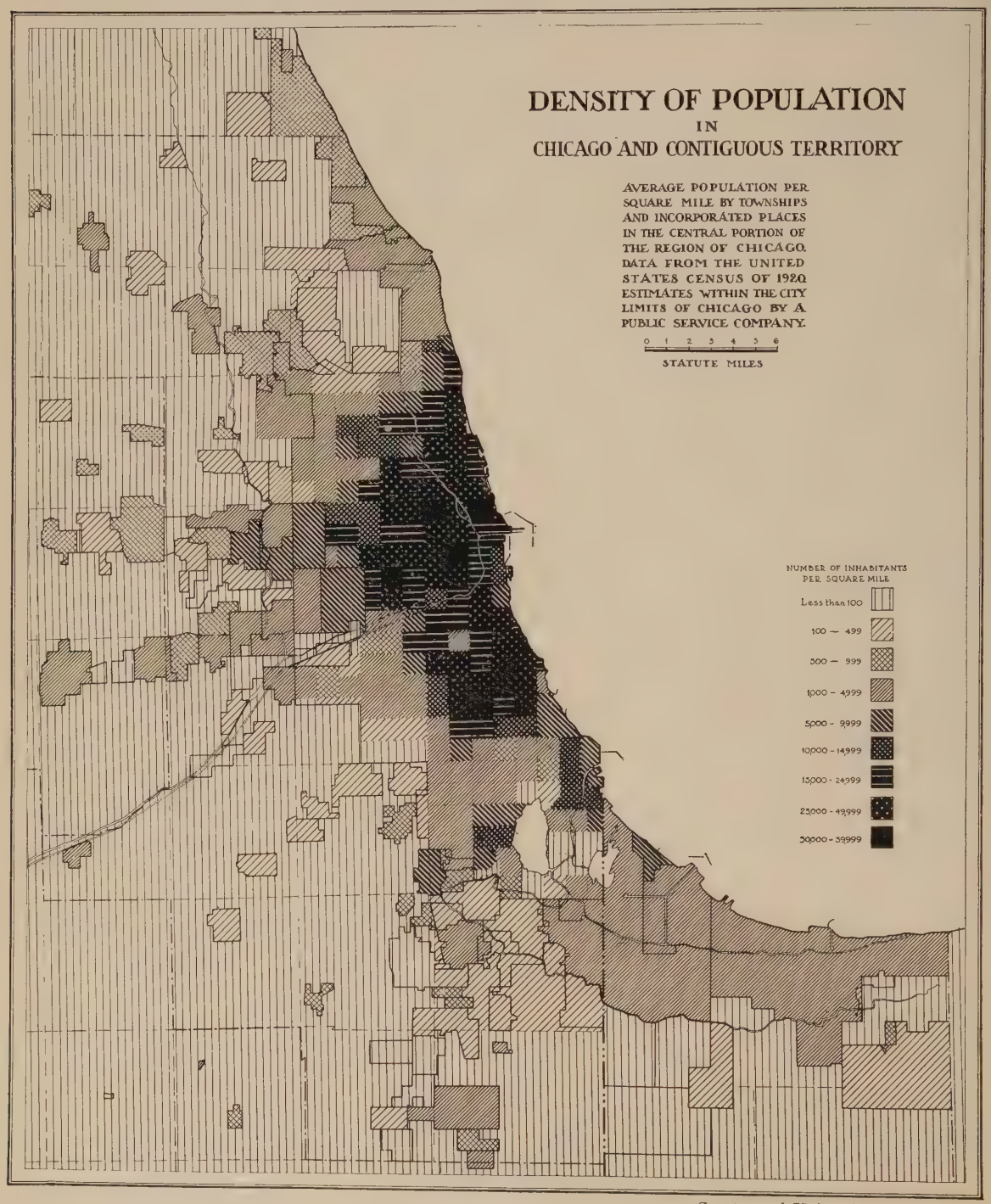
The principal streams which drain these uplands are the Fox River, the Des Plaines River and the Kankakee River. The Fox River rises in Wisconsin some twenty-five miles above the state line, and flows south of the state line about thirty miles inland from the lake for a distance of one hundred and fifteen miles to join the Illinois River at Ottawa. It is a stream of low discharge and comparatively steep slope. It has never been improved for navigation purposes. Several water power dams have been built, forming pools which are navigated by numerous launches, but there is no commercial navigation except for excursion purposes.

The Des Plaines River rises in Kenosha County, Wisconsin, and flows south some five to ten miles to the west of Lake Michigan to a point south of Riverside where it turns southwest for about eighteen miles to Joliet, thence to its junction with the Kankakee River to form the Illinois River. Though this stream has no commercial navigation at present and its course is obstructed by boulders, narrows and rapids, it has been held by the United States Supreme Court to be a navigable stream.

The Kankakee River is largely outside the limits of the Chicago Region and is therefore worthy of mention only as one of the headwater branches of the Illinois River.

Generally the soil in the vicinity of the City of

Chicago has little rock in it and bed rock is deep below the surface, making excavation simple, but heavy foundation work difficult and expensive. There are a few surface exposures but the average depth in the city has been estimated at fifty feet with a maximum of one hundred and thirty feet. Large exposures occur along the Chicago Outlet, notably at Summit, Lemont and along the Main Drainage Canal to Lockport and at Joliet. Construction operations involving extensive excavation will be extremely expensive wherever these exposures occur.


DENSITY OF POPULATION
IN
CHICAGO AND CONTIGUOUS TERRITORY
AVERAGE POPULATION PER SQUARE MILE BY TOWNSHIPS AND INCORPORATED PLACES IN THE CENTRAL PORTION OF THE REGION OF CHICAGO. DATA FROM THE UNITED STATES CENSUS OF 1920. ESTIMATES WITHIN THE CITY LIMITS OF CHICAGO BY A PUBLIC SERVICE COMPANY.
0 1 2 3 4 5 6
STATUTE MILES
NUMBER OF INHABITANTS PER SQUARE MILE
Less than 100
100 — 499
500 — 999
1000 - 4999
5000 - 9999
10000 - 14999
15000 - 24999
25000 - 49999
50000 - 99999

Courtesy of University of Chicago.

WATERFRONT OCCVPATION

IN THE

REGION OF CHICAGO

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
STATUTE MILES

BASE MAP BY
CHICAGO REGIONAL PLANNING ASSOCIATION

COMPILATION BY
THE HARBOR PLAN OF CHICAGO

LEGEND:

- PARKS AND RESIDENCES
- RAILROAD PROPERTY
- COMMERCIAL PROPERTY
- INDUSTRIAL PROPERTY
- IMPORTANT STREAMS, CANALS AND INTERIOR LAKES.

LAKE MICHIGAN

WISCONSIN
ILLINOIS

Racine
Kenosha
Waukegan
North Chicago
Great Lakes Naval Station
Lake Bluff
Lake Forest
Ft. Sheridan
Highland Park
Winnetka
Wilmette
Evanston
Chicago
Calumet Harbor
Whiting
Indiana Harbor
East Chicago
Buffington Harbor
Gary
Michigan City
Joliet

DES PLAINES RIVER
NORTH SHORE CHANNEL
CHICAGO RIVER
CHICAGO DRAINAGE CANAL
CALUMET SAG CHANNEL
GRAND CALUMET RIVER
LITTLE CALUMET RIVER
ILLINOIS
INDIANA

N

POPULATION, AREA AND OCCUPATION

The Chicago Region covers an area of approximately 6800 square miles of which 600 lie in the State of Wisconsin, 4700 in Illinois and 1500 in Indiana. The total population in 1920 was approximately 3,800,000 of which 102,000 were in Wisconsin, 3,512,000 were in Illinois and 185,500 in Indiana. The estimated population of the region as of January 1, 1927 was 4,600,000. About 10% of the inhabitants are rural, the remainder living in cities and villages of a population of 2500 or over. The 1920 population densities were 170 per square mile for the portion of the region in Wisconsin, 747 for the part in Illinois, and 124 per square mile in Indiana.

Of the 500 square miles of urban area in the Chicago Region about 420 have been zoned for various purposes. A little over 25%, or 112 square miles, of this zoned area has been set aside for industrial purposes though there is no information available as to how much of this is actually in use. Considering the small percentage of the area of the region occupied by cities and villages, and the still smaller amount zoned for industrial purposes, it is evident that there is room for expansion of both.

Chicago was originally built on the banks of the Chicago River and near its mouth. However, the urban growth has not been radial as the Lake Michigan shore has been a strong factor in guiding the direction of civic development. The lake has not only attracted intensive residential occupation, it has also drawn to its shore a remarkable group of industries requiring the use of its waters for either transportation or manufacturing purposes. The result is that while the urban area occupies only a small portion of the entire region, it has filled in practically solid the forty-five miles of lake front in Illinois, and large parts of the frontage in the other states as well.

The interior connecting waterways which have been improved for purposes of navigation have had a history similar to that of the lake front. With these, however, the occupation is largely commercial and industrial, though a great deal of the riparian use bears no relation to water transportation.

WATER CARRIERS AND ROUTES

GREAT LAKES ROUTES

The Great Lakes and their connecting channels form a natural highway having a water surface area of over 95,000 square miles, and a shore line of about 8300 miles. These lakes and channels afford access to a region notable for its natural resources. From the point of volume and importance of traffic this inland water group has no equal as an inland route for waterborne commerce.

Between Chicago and Lake Superior points the rapids of St. Mary's River have been overcome by the Soo Locks.

The Inter-lake channels above Buffalo have been improved to depths in excess of 20 feet, and Niagara Falls is overcome by the Welland Canal, 26¾ miles long, with twenty-five lift locks of 255 feet available length, 45 feet width, and 14 feet depth on the sills. A new and somewhat shorter canal is now being built, with seven 800 foot by 80 foot locks having a lift of 46½ feet each. The least depth in the canal will be twenty-five feet, but lock sills afford a thirty-foot depth, so that channel deepening to thirty feet will not involve reconstruction.

From Montreal, the head of deep draft ocean navigation, the sailing distance to the westerly end of Lake Superior is about 1340 miles, and to the southerly end of Lake Michigan, about 1200 miles, about 1000 miles being through open lakes in each case. The St. Lawrence River is 1185 miles long, 182 miles of which are above Montreal. Between Lake Ontario and Galop Island, 68 miles, the channel is thirty feet or more in depth, with a minimum width of five hundred feet; thence to Montreal the rapids are overcome by a series of side canals and locks, the forty-six miles of canals having a least bottom width of eighty feet. The locks have widths as low as forty-five feet, depths of fourteen feet and lengths of two hundred and seventy feet.

The Joint Board of Engineers appointed by the Canadian and United States Governments to consider a plan for improvement of the St. Lawrence River has recommended a plan which would reduce the number of miles of restricted channel between Montreal and Lake Ontario to twenty-five, with not more than nine locks and eight bridges and channel depths of twenty-five feet, and with a thirty foot depth over the sills of locks and other fixed obstructions. The locks are proposed to be 800 feet long by 80 feet wide. The restricted channels will vary in width from 220 to 400 feet.

Courtesy of Illinois Steel Co.

LAKE TYPE BULK FREIGHT STEAMER

The following table summarizes the characteristics of the existing and proposed waterways between Chicago and the Atlantic Ocean by way of the St. Lawrence River:

	Present Channels	Proposed Channels
Lake or Gulf navigation—miles	1633.5	1633.5
Open River navigation—miles	540.0	565.0
Restricted river and canal navigation—miles	75.5	48.5
Total length—miles	2249.	2247.
Number of locks	47	14-16
Least depth at low water	14 feet	25 to 30 feet
Lateral dimensions of smallest lock	255 x 45 feet	800 by 80 feet
Minimum bottom width of restricted channel	80 feet	200 feet

During the winter season the connecting channels of the Great Lakes, and to some extent their harbors, are closed to navigation by ice. Navigation to Montreal is open on an average two hundred and fifteen days a year, usually being suspended from November 25 to April 24. The average length of season on the Erie Canal between 1891 and 1905 was two hundred and sixteen days. The Welland Canal has an average navigation season of two hundred and thirty-seven days and St. Marys Falls canals two hundred and twenty-four days. The harbors of the Great Lakes are open somewhat longer, the average for Buffalo being two hundred and forty-eight days, Cleveland two hundred and seventy-one days and Duluth two hundred and thirty-seven days.

The existing channels of the Great Lakes and the upper St. Lawrence River are subject to occasional light fogs in the early morning. These clear up rapidly. Fogs occur in the Gulf and lower river during the navigable season and sometimes last several days. The fogs encountered in the lower St. Lawrence and the Gulf of St. Lawrence, however, are of less frequency and density than those encountered on the regular routes of vessels in the North Atlantic trade.

LAKE VESSELS

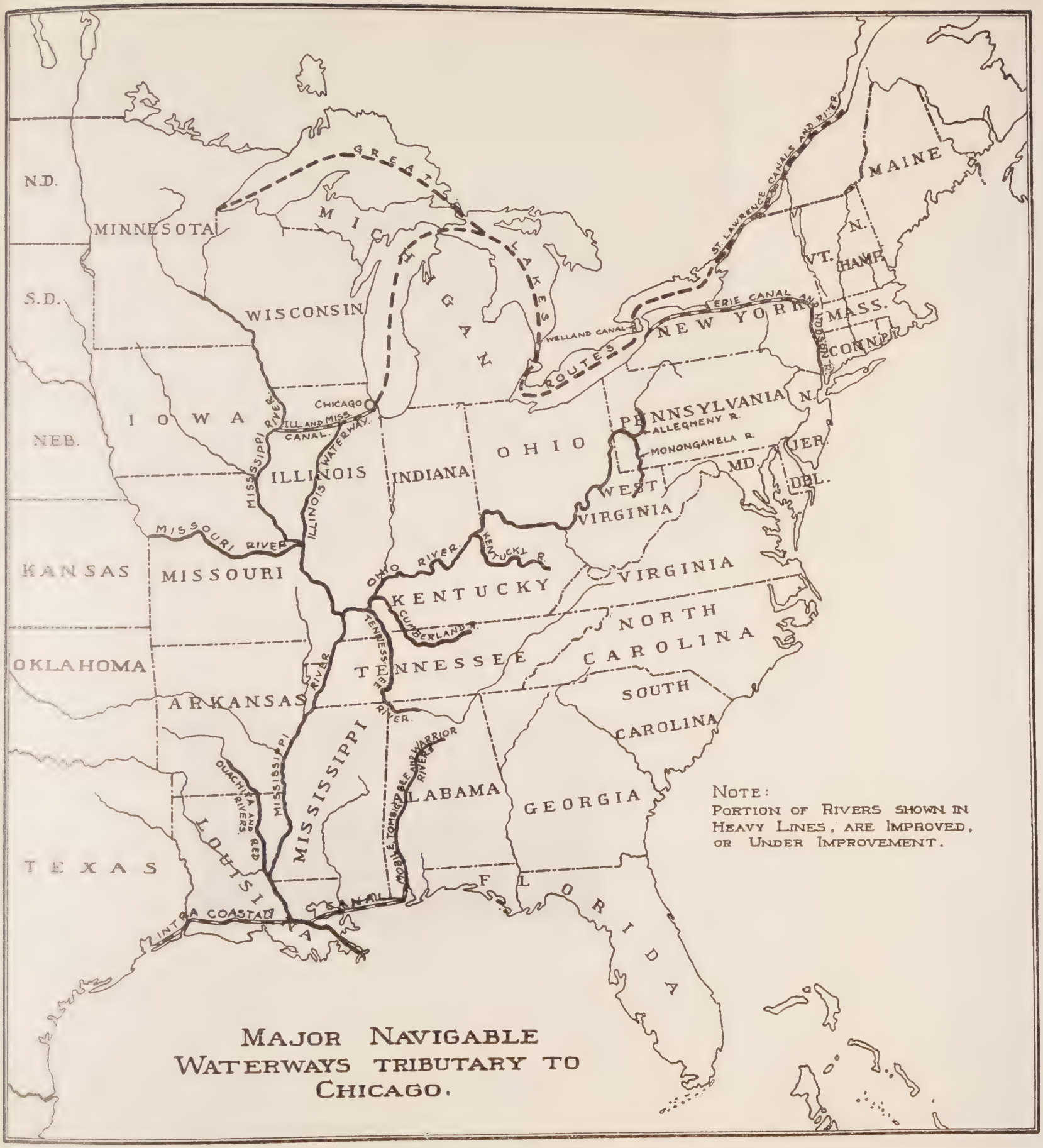
The American lake fleet on May 1, 1925 aggregated about 2,800,000 gross tons, 2,550,000 tons being in steam vessels and the balance in sailing vessels, barges and canal boats. Of all the ships on the Great Lakes of 1000 gross tons register, and over, 501 sailed under the American flag, 201 under the Canadian and 1 under the Norwegian flag.

The average registered tonnage of all vessels was about 1000 gross tons; the average registered tonnage of ships of 1000 gross tons register, and more, was 4000 gross tons. Of this group of 706 larger vessels 626 were bulk freighters, 70 were passenger and package freight steamers and 10 were tankers.

The modern lake bulk freighter has been created in response to a demand for the transportation of an enormous amount of freight over a regular route in a limited navigation season. The typical carrier has its power plant far aft and its quarters in the extreme forward end, the space lying between being unobstructed cargo hold. The entire deck is covered with hatches which are usually spaced twelve feet between centers and register exactly with the pockets in the ore piers.

The largest of these freighters are about 625 feet long and 64 feet in beam with a depth of hull of 33 feet. Headroom requirements are 110 feet. Half the tonnage is in ships 450 feet in length or more

Lake Type Self-Unloading Bulk Freighter



MAJOR NAVIGABLE WATERWAYS TRIBUTARY TO CHICAGO.

le the average length of new vessels built each r has exceeded 550 feet for the past ten years.

he carrying capacity of the largest of the bulk ighters is about 14,000 tons. The average ca- ity of those built since 1910 is in excess of 00 tons.

Most of these vessels require shore equipment discharging cargoes. A few of the self-unloader e have been built for handling stone and coal, ng provided with means of transferring the cargo m the hold to a belt conveyor on a boom which y be swung so as to discharge from 100 to 120 t back of the face of the wharf. The more mod- vessels of this type have discharging capacities excess of 2000 tons per hour.

Of peculiar local interest at Chicago are the self- ding and self-unloading vessels used in the sand l gravel trade. Several of these operate across lower end of Lake Michigan bringing sand and vel to building material yards on the Calumet l Chicago rivers. These vessels discharge their go either hydraulically or by conveyor. The ger ones are about 260 feet long with a beam of ½ feet and a height above water of over 50 feet.

Between Port Colborne and Montreal bulk freighters are smaller than corresponding all-lake carriers, due to channel restrictions, the newer vessels being 261 feet long and about 43 feet wide, with a capacity of 2500 to 3150 tons on a draft of 13.5 feet.

On May 1, 1925, there were 70 steamers of 1000 gross tons register and upwards, aggregating 213,557 tons, in the passenger and package-freight trade on the Great Lakes; 45 were of American registry, the remainder being under the Canadian flag. About half of these vessels are engaged as package freight carriers exclusively, having little or no accommodations for passengers. Some of them occasionally enter the bulk freight trade and are equipped with top as well as side hatches.

These vessels vary in length from 175 feet to 550 feet, from 32 feet to 58 feet in beam, and from 1000 to 7500 gross tons in register.

Package freight is loaded or discharged through side hatches, so ship's rig is not effective for handling this class of cargo.

Courtesy of Goodrich Transit Company.

PASSENGER AND PACKAGE FREIGHT LAKE VESSEL

OCEAN VESSELS

Maritime traffic is handled by four classes of vessels: Express liners, combination passenger and freight liners, cargo liners and tramps. Express liners have small cargo space and operate on a schedule which leaves little time for taking on and discharging cargo. The largest vessels afloat may be found in this class. But few harbors in the world have been deepened to accommodate them. They draw upwards of 30 feet of water, so that none of the proposed improvements between the Great Lakes and the Atlantic Ocean will permit their entering the Great Lakes.

Next in size are the combination passenger and freight liners. They operate chiefly from Montreal, Quebec, Boston, New York, San Francisco, Seattle and Vancouver. Many of them require depths in excess of 35 feet, though a number operate successfully from Montreal where the limiting draft is 28 feet. Chicago is more likely to attract this type of vessel than any other lake port, and while the number never may be very large, it is wise to plan to accommodate them.

The largest vessels now reaching Montreal are about 14,000 gross tons register, from 550 to 600 feet in length and from 65 to 70 feet in beam. As far as lateral dimensions go these boats are slightly shorter and wider than the larger bulk freight carriers.

The cargo liner and the tramp perform the bulk of the freight carrying business on the ocean. The cargo liner carries freight exclusively and plies regularly over the same routes, while the tramps engage in the same class of business but have no fixed routes or ports of call. These vessels will constitute the majority of arrivals and departures at Chicago's harbor or harbors, as far as ocean vessels are concerned, and for this reason their characteristics are of peculiar interest.

In the coastwise trade vessels would be exclusively of American registry. At present there are about 800 such ships of 1000 tons (and over) register. About 200 of these have a draft of 23 feet or less. The average cargo capacity of these smaller ships is 3750 tons and the average net register tonnage is 1500 tons. They vary in length from about 200 feet to 350 feet and in beam from 36 feet to 47 feet.

Headroom requirements of ocean vessels which are likely to enter the lakes are over 100 feet.

Ocean Passenger and Freight Liner on St. Lawrence River

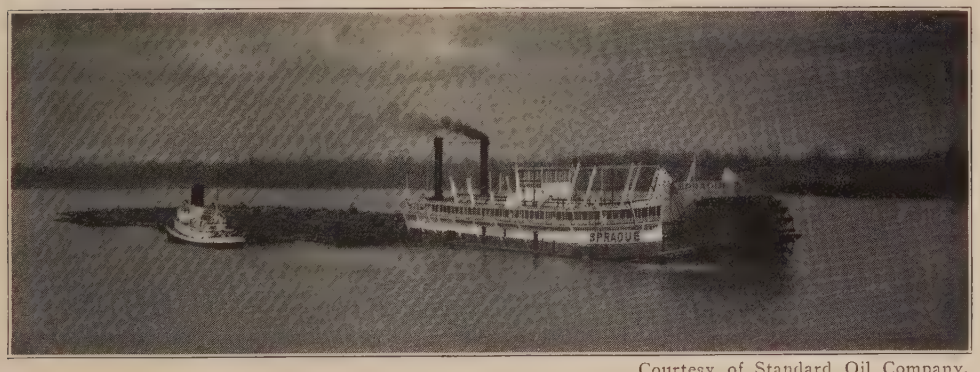
INLAND WATERWAY ROUTES AND CRAFT

The Mississippi system of waterways includes as its major features the Mississippi River from its mouth to the head of navigation at St. Paul; the Ohio River and its tributaries such as the Allegheny, Monongahela, Kanawha, Tennessee and Cumberland Rivers, the Missouri River; and the Illinois Waterway and River. From New Orleans to the east and west extend portions of the Intracoastal Waterway. These streams and canals are in various stages of completion as to improvement and present a multiplicity of controlling dimensions. The following table gives salient features of the more important of these improvements as of July 1, 1926:

CHARACTERISTICS OF THE MISSISSIPPI SYSTEM OF WATERWAYS

Improvement	Project Dimensions		Controlling Dimensions 1926			Number of Locks	Size of Smallest Lock	Number of Bridges	
	Width Feet	Depth Feet	Width Feet	Depth Feet	Length Miles			High or Fixed	Movable
Mississippi—									
Mouth to New Orleans	1,000	35	500	38	114.3	0	—	0	0
New Orleans to Baton Rouge	250	9	*	35	132.0	0	—	0	0
Baton Rouge to Cairo	250	9	250	9	841.0	0	—	2	0
Cairo to St. Louis	200	8	200	6 to 8	183.0	0	—	4	0
St. Louis to Minneapolis	200	6	200	5	686.0	3	350 x 80 x 6	17	24
Intracoastal Canal—									
New Orleans to Mobile	100	10	100	9.7	170	1	640 x 75 x 31.5	0	4
New Orleans to Galveston	100	9			450	0			
Ouachita River and Red River	*	6.5	*	6.5	394	6	268 x 55 x 6.5	x	x
Missouri River—									
Mouth to Kansas City	200	6	*	3.5	390	0	—	13	
Kansas City to Sioux City	*	6	*	3.0	417	0	—	13	
Ohio River	*	9	400	4.0 to 6.0	968.5	52	600 x 110 x 11.0	37	
Cumberland River—to Carthage, Tenn.	*	6	*	3.5	318.2	13	280 x 52 x 6.5	8	4
Tennessee River—to Florence, Ala.	*	5	*	4.0	256.5	1	287 x 80 x 6.25	3	
Monongahela River	*	6	125 to 500	6.0	130.0	14	160 x 50 x 5.6	32	
Allegheny River	*	7	*	*	53.3	8	289 x 56 x 7.0	22	
Kentucky River	*	6	*	6.0	260.0	14	145 x 37 x 6.0	x	
Illinois River	200	9	73	7.0	224.0	4	350 x 73 x 7.0	0	20
Illinois Waterway, and Chicago Drainage Canal	150	9	Under Construction		98.0	5	600 x 110 x 14.0	21	17
Illinois & Mississippi Canal	80	7	80	7.0	75.0	32	141 x 35 x 7.0	79	

*Indefinite.
xNot available.



Courtesy of Standard Oil Company.

TOWBOAT AND OIL BARGES—LOWER MISSISSIPPI

Within the next five years it is possible that all of these projects now under construction will be completed, except perhaps the improvement of the Missouri River and the Tennessee River. Approximately 5000 miles of improved rivers and canals will be open to navigation and have low water depth in excess of six feet. The Mississippi River between the mouth of the Illinois and Cairo may be deepened to nine feet shortly thereafter.

The towboats and barges in use by the Mississippi Service of the Federal Barge Line are fairly indicative of the types to be expected in the future at Chicago, though it is understood that several years' experience on the part of the Barge Line indicate that the floating stock used is not entirely suited either to the purposes for which used or to the rivers on which propelled.

The towed barges used for general cargo purposes are 230 feet long, 45 feet wide and have hulls 10 feet deep. They are equipped with cargo houses so that they require 20 feet 3 inches of headroom when light, and about 12 feet 9 inches when loaded to a draft of 9 feet. The open top bulk cargo barges are 300 feet long, 48 feet wide, and have hulls 10 feet deep which require about 9 feet of headroom when light. The towboats used are upwards of 175 feet in length and 40 feet in width, and require a headroom in excess of 37½ feet.

The self propelled barges now in use are 280 feet long and 50 feet wide. They also require more than 37½ feet of headroom.

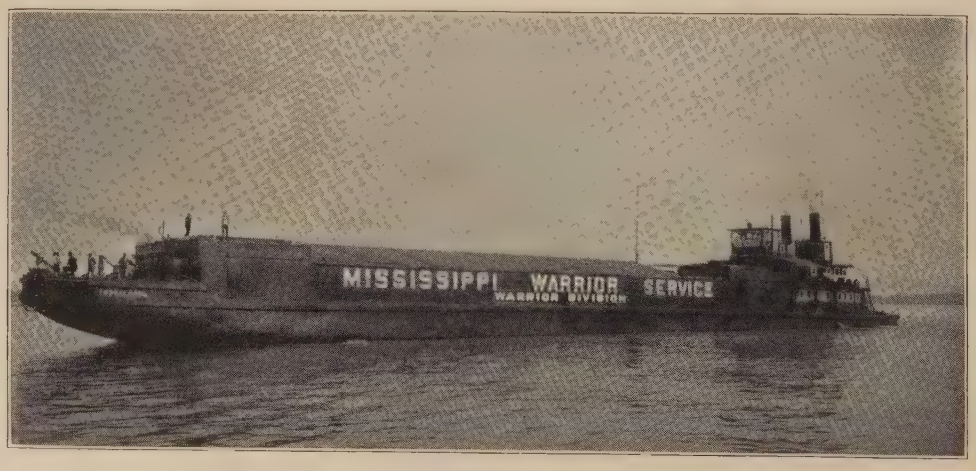
Boats used for passenger service on the Mississippi River and its tributaries are mostly stern wheel craft, and in the past have operated a combined passenger and package freight service. The largest of these boats are over 450 feet long, 60 feet wide and carry as many as 600 passengers. They require as much as 45 feet of headroom.

Except in isolated cases, smaller barges than those of the Federal Barge Line will likely be found suitable for general use, on account of greater flexibility at terminals and better adaptation to channel characteristics. Barges of from 150 to 175 feet in length, 35 to 40 feet in width, and with cargo capacity of not to exceed 1000 tons seem to be about ideal for general use. The size of the towboats used will depend upon the size of tows as limited by channel dimensions and obstructions.

In the Chicago Region limitations imposed by rock sections, bridge draws, and similar obstructions will make it impracticable to operate barge fleets east of Lockport. At Lockport, or at some point west, it will be necessary to break up the tows and bring the barges into Chicago one or two at a time by ordinary harbor tugs of low headroom requirements. River towboats need not be expected in Chicago.

Self propelled barges operating between Chicago and New Orleans or Pittsburg could be as long as 325 feet and as wide as 65 or 70 feet and there is reason to believe that they will be built to those dimensions whenever traffic is of sufficient volume. If provided with Diesel engine drive these barges in bulk cargo service may be built to clear bridges providing 16½ feet of headroom.

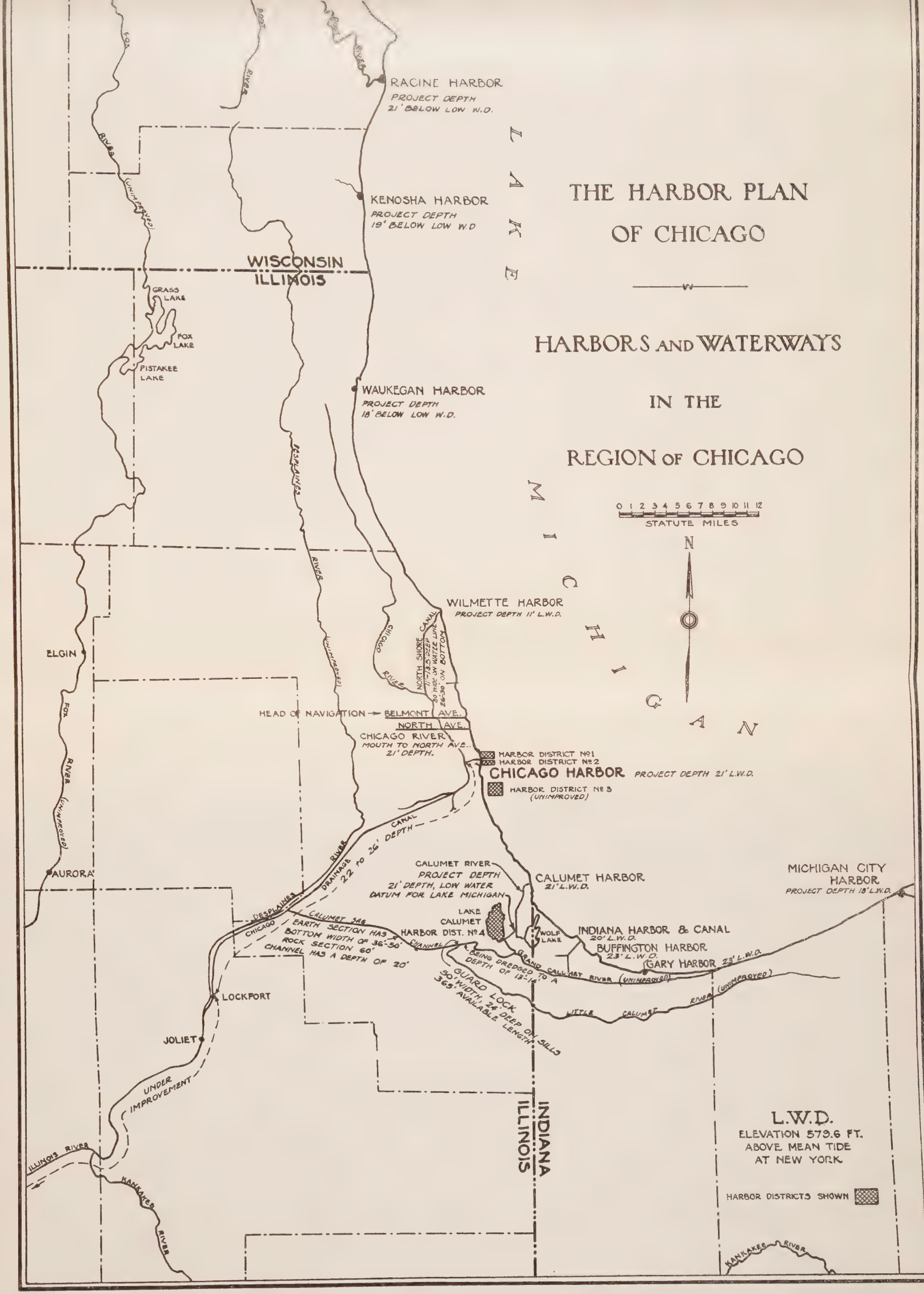
As long as the locks are retained in the lower Illinois River passenger boats will be limited in length to 325 feet. Their width may be 70 feet.



Self-Propelled Barge "Tuscaloosa"

THE HARBOR PLAN OF CHICAGO

HARBORS AND WATERWAYS IN THE REGION OF CHICAGO



HARBOR CRAFT

The term harbor craft includes tugs, lighters, car floats, fire boats, and derricks, pile-drivers, dredges and other construction floating plant.

In general, if there is ample space in a harbor for the complete service of ships there is enough for the ordinary number of auxiliary floating equipment, but where some special condition requires the use of car floats or lighters, for instance, congestion will result unless special provision is made for them.

Harbor tugs and lighters are craft of low headroom. They have been built and operated successfully with bridge clearances as low as 15 feet. Steam operated fire boats are high headroom vessels, requiring upwards of 30 feet under bridges. Lateral dimensions vary considerably though it is unusual to find lengths in excess of 100 feet and widths greater than 25 feet.

Car floats are ordinarily deck barges with rails on the decks accommodating from eight to fifteen cars. Those operating on the Chicago River are from 175 to 185 feet long, 34 feet wide and require 22 feet of headroom when loaded with one light car. If these floats were built with ramps at one or both ends the cars could be set down inside the barges and headroom requirements decreased to as low as 14½ feet.

Marine construction equipment, such as dredges, pile drivers and derricks are generally between 100 and 200 feet in length and between 30 and 50 feet in width. These craft seldom draw over 10 feet of water, but they all have high headroom requirements, usually 50 feet or more.

HARBORS IN THE CHICAGO REGION

There are seven public and two private harbors in the Chicago Region on Lake Michigan, included within which are some 1600 acres of sheltered water area on the lake front and about 80 miles of improved interior waterways with channel depths of 15 feet or more. These harbors and interior waterways have a total improved water front, including piers and slips, of approximately 72 miles of which about 40 miles are in use to some extent for receiving or shipping goods by water.

The harbors at Racine, Kenosha, Chicago, South Chicago and Michigan City are at the entrances to small streams. As shipping developed, piers were built into the lake, channels were dredged, the streams widened, deepened and straightened, the banks were revetted, and necessary terminal facilities installed. Bridges were thrown across these interior harbors and as congestion of traffic by water and by land increased, breakwaters were constructed to provide lake front anchorage basins, permit construction of lake front terminals, and further shelter the interior harbor approaches.

The harbors at Waukegan, Indiana Harbor, Buffington and Gary had no streams as interior harbors for their beginnings. Indiana Harbor was built at the entrance to an artificial canal, while the other three have been constructed by reclamation of submerged lands along the lake shore.

The government projects for the improvement of these public harbors and connecting waterways have been practically completed. Operations are confined almost exclusively to maintenance.

There are no tides on Lake Michigan but a succession of years of high precipitation will bring about a high stage and several years of low precipitation will bring about a low stage, these fluctuations affecting each harbor.

Seasonal changes of as great as one foot between high and low stage also take place, resulting from seasonal variation in precipitation. There are also diurnal fluctuations brought about by wind or barometric pressure, or both. The seasonal changes affect the entire lake; the diurnal fluctuations are largely local. These stages are superimposed upon those resulting from the cyclical variations, sometimes so as to increase the range, and at other times so as to decrease it. The lower stages resulting from a combination of these changes in elevation have a decided effect upon the life of marine structures.

These changes in elevation of water surface are small, however, compared to tidal changes at seaports or river fluctuations at river ports, and present no serious diffculties.

While some of the harbors are not used for navigation from about December 14 to April 15,

they all probably could be kept open if desired. Solid ice does not form thick enough to prevent a vessel from wedging a way through, though sometimes wind piles up loose ice to such an extent that it is very diffcult for a vessel to enter a harbor until after the wind dies down or shifts.

The harbors at Racine, Kenosha and Waukegan are comparatively difficult to maintain as to depth, for there is a littoral drift of sand to the south which forms a bar across the entrance to the last, while in the first two there is a great deal of silt deposited by the tributary streams in time of flood which requires frequent removal. The sand drift prevails all along the western shore of the lake in the Chicago Region, but it is effective only at Waukegan because the entrance betwen the piers has not been enclosed by the breakwater.

The North Branch of the Chicago River requires considerable maintenance dredging for it is continually being filled in by silt and by deposits of sewage sludge. The upper section of the Calumet River is similarly affected. Annual maintenance dredging is required in the Indiana Harbor Canal as much of the bank is still unrevetted and erosion and sliding are quite extensive. Trail Creek at Michigan City fills in with silt brought down by floods, and there is some littoral sand drift to decrease the depths in the harbor entrance. In no place is the maintenance of depths difficult, however, though the situation at Waukegan requires the most attention.

The exposures of the harbors being different, navigation conditions are not all the same. Those on the south are the most difficult to enter in times of severe storms, Michigan City being particularly bad in this respect.

Wind and visibility conditions at the harbors are approximately the same except for Chicago and South Chicago where the great amount of smoke added to the fogs which prevail generally throughout the region increases the navigation hazard.

The principal obstructions to navigation in the interior harbors and connecting waterways are bridges, though narrow sections, sharp bends and currents also have their effect. The following table gives the situation as to bridges:

Waterway	Location	Number of Bridges Over Useable Section	Average Distance Between Bridges—Miles	Least Available Width of Draw Feet	Least Clearance Above Low Water—Feet	Number of Bridges With Clearance of Under 16.5 Feet	Remarks
Root River	Racine	3	0.23	44	8.3	1	Movable
Pike Creek	Kenosha	2	0.30	53	10.0	1	Movable
Chicago River	Chicago	62	0.23	41 (1) 54 (2)	5.3	18	(1) Fixed span (2) Swing
Calumet River	Chicago	15	0.50	70	5.7	9	Movable
Little Calumet	Chicago to Blue Island	8	0.83	31.9 (1) 50.9 (2)	8.8	5	(1) Fixed span (2) Swing
Indiana Harbor Canal	Indiana Harbor	11	0.32	62.5	4.3	11	Movable
Trail Creek	Michigan City	4	0.42	40.8	7.4	4	Movable
Main Drainage Canal	Chicago to Lockport	18	1.61	72.1	2.9	4.0	Movable
North Shore Channel		24	0.35	32.0	15.9	20	Fixed
Sag Channel	Blue Island to Sag	25	0.65	50.0	15.7	1	Fixed

As a general rule where bulk commodities are handled in considerable quantity efficient terminal facilities have been installed by the industries or other agencies directly involved. The most modern type of equipment for discharging ore, coal and stone are to be found at Gary, Indiana Harbor and South Chicago, while the newer elevators on the Calumet River are as efficient as any to be found.

With the exception of the Municipal Pier at Chicago the arrangements for handling general package freight between shore and ship are largely makeshifts. In practically every instance a light shed, not necessarily fireproof, is thrown over a transfer platform, and no provision is made for mechanical handling, either between ship and shed, within the shed itself, or between shed and land carrier.

There is no public dock in the Chicago Region adequately equipped to transfer heavy articles between rail and ship.

THE HIGHWAYS OF THE CHICAGO REGION

Until quite recently the planning and construction of new highway systems in the Chicago Region have been characterized by more or less haphazard and uncorrelated efforts on the part of three state highway departments and thirteen county boards.

During the past few years, however, through the agency of the Chicago Regional Planning Association, a marked change has characterized this unhealthy trend of affairs. The first step has been to connect up the loose ends of local highway nets where they ended in the air, so-to-speak, at the state or county boundary lines.

The second step has been in the direction of obtaining wider rights of way. Six counties in the region have adopted rules for the dedication by sub-dividers of rights of way of 100 feet in width along section lines, and 80 feet in width on half section lines. Up to January 1, 1927 190 miles of connected 80 foot right of way and 210 miles of connected 100 foot right of way had been so provided. Wider road construction of uniform dimensions will be a sequel to this wise policy.

The third objective of this movement for an adequate and correlated highway system for the Chicago Region is the provision of means of circulation between parts outside of the congested districts. Most of the effort in highway building so far has been directed towards providing more roads between the city of Chicago and the outlying districts; as a result the system is largely radial, and circumferential roads are almost non-existent.

Circumferential highways are almost requisite to a comprehensive development of ports and waterways in the Chicago Region. Whether harbor facilities are located at remote parts of the region or not, belt roads are as necessary as radial highways to permit the easy pick up and delivery of trucked freight. The cost of trucking is a function of the time a journey takes, and congestion is more a consumer of time than is distance.

There is nothing in the general highway situation to influence the location of harbor facilities in the Chicago Region. Highways are perhaps the most flexible of the various means of surface communication, and they are especially so in a region devoid of grades and other difficult construction problems. It is safe to assume that the highway situation may be easily adjusted to meet conditions imposed by any scheme of harbor development.

SUMATRA QUAY—AMSTERDAM

HIGHWAYS
IN THE
REGION OF CHICAGO

APRIL 1927

—— PAVEMENT

---- RECOMMENDED PAVEMENT

SCALE IN MILES

CHICAGO REGIONAL PLANNING ASSOCIATION
BURNHAM BUILDING CHICAGO

FOR

THE HARBOR PLAN OF CHICAGO

RACINE
LAKE GENEVA
KENOSHA
WAUKEGAN
WOODSTOCK
HIGHLAND PARK
ELGIN
AURORA
JOLIET
MORRIS
KANKAKEE
CHICAGO
HAMMOND
WHITING
E. CHICAGO
GARY
MICHIGAN CITY
LAPORTE
MUNSTER
HIGHLAND
GRIFFITH
DYER
VALPARAISO
WINAMAC

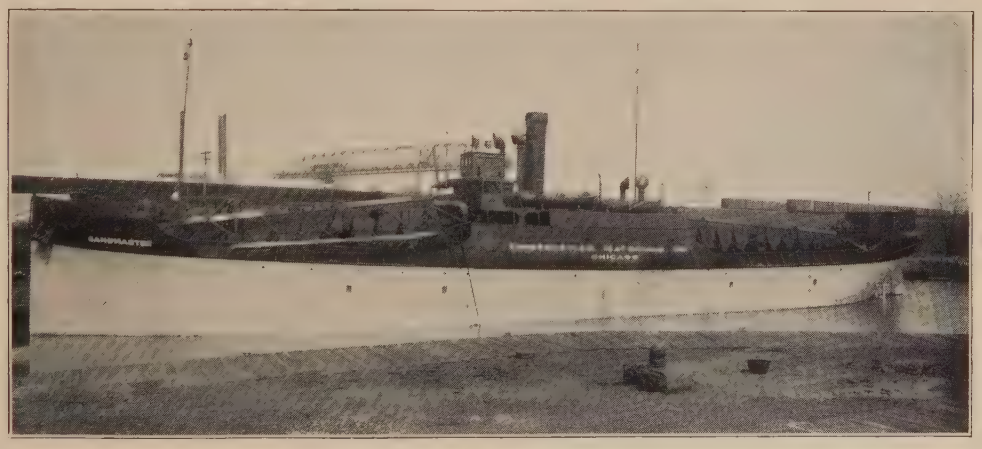
IX.

TRAFFIC

EXISTING WATERBORNE TRAFFIC IN THE CHICAGO REGION

THERE are nine harbors in the Chicago Region at which commercial vessels receive or discharge cargo. These are Racine, Kenosha, Waukegan, Chicago, South Chicago, Indiana Harbor, Michigan City, and the private harbors at Buffington and Gary. Published commercial statistics show the following combined waterborne movement for the seven public harbors:

Year	Tons	Value	Passengers
1910	12,100,668	.....	1,730 913
1911	11,152,958	.....	1,829,395
1912	12,500,631	.....	1,677,395
1913	14,740,880	$427,670,000	1,311,177
1914	12,547,142	430,677,000	1,327,660
1915	12,794,599	411,331,000	733,981
1916	15,391,863	489,419,000	1,386,593
1917	14,868,615	490,124,000	959,894
1918	16,093 787	392,108,000	759.352
1919	13,416,106	346,453,000	1,104,994
1920	15,406,692	340,516,000	992,989
1921	11,659,299	263,357,000	1,410,223
1922	15,797 263	360,882,000	1,417,041
1923	18,469,812	324,593,000	1,409.145
1924	15,715,264	401,593,000	1,212,613
1925	20,162,987	407,916,000	1,400,557



Self-Unloading Diesel-Electric Sand Dredge

No statistics are published for Gary Harbor, but it is understood that the commerce at that port now varies between four and six million tons annually. It consists of ore and limestone, and has a value of approximately $25,000,000. Buffington Harbor has been in use for only a short time so that no statistics of value are available.

The table showing 1925 commerce in the Chicago Region involves some duplication due to the fact that a small amount of interport trade exists. There is also an intraport movement on the Chicago River and Drainage Canal amounting to about 750,000 tons annually with a value in the neighborhood of $100,000,000, but this has not been included.

In round numbers, and allowing for these corrections, the total waterborne traffic in the Chicago Region at the present time varies between 20,000,000 and 25,000,000 tons annually with a value of between $450,000,000 and $500,000,000; in addition there is a passenger traffic, largely out of Chicago Harbor, involving the annual movement of about 1,400,000 persons. Combined arrivals and departures of vessels amount to 12,500, with a net registered tonnage of approximately 25,000,000 tons.

COMMERCE AT HARBORS IN CHICAGO REGION

(TONS OF 2,000 LBS.)

	RACINE	KENOSHA	WAUKEGAN	CHICAGO	SOUTH CHICAGO	INDIANA HARBOR	MICHIGAN CITY	TOTAL
RECEIPTS:								
Bulk Cargo:								
Ore				5,266	7,387,755	2,132,811		9,525,832
Grain				78,250	137,397			215,647
Anthracite	14,852	980	23,117	160,357	57,071			256,377
Bituminous Coal	184,229	12,925	64,565	62,160	1,410,172	1,280,205		3,014,256
Lumber				21,998	1,490			23,488
Building Materials	6,212	40,493		738,530	409,909	1,600	12,500	1,209,244
Fluxing Stone					1,795,418	535,673		2,331,091
Salt				78,530				78,530
Miscellaneous	10,656	1,820			12,500	5,300		30,276
Total Bulk Receipts	215,949	56,218	87,682	1,145,091	11,211,712	3,955,589	12,500	16,684,741
General Cargo:								
Machinery and Vehicles		13,550		54,098			4	67,652
Sugar				6,594				6,594
Newsprint				36,964				36,964
Fish	215	215		979			371	1,780
Fruits and Vegetables	105	539	30	55,382		6		56,062
Miscellaneous	700	5,567	4,804	352,182	60,676		9,450	433,379
Total General Receipts	1,020	19,871	4,834	506,199	60,676	6	9,825	602,431
Combined Receipts:								
Bulk and General Cargo	216,969	76,089	92,516	1,651,290	11,272,388	3,955,595	22,325	17,287,172
SHIPMENTS:								
Bulk Cargo:								
Building Materials						478,996		478,996
Grain				216,139	815,418			1,031,557
Petroleum Products						828,236		828,236
Miscellaneous					108,400			108,400
Total Bulk Shipments				216,139	923,818	1,307,232		2,447,189
General Cargo:								
Flour and Millstuffs				92,572	5,627			98,199
Iron and Steel Products				7,874	60,649	24,548		93,071
Miscellaneous	15,878	21,279	1,736	171,745	23,688	385	2,645	237,356
Total General Shipments	15,878	21,279	1,736	272,191	89,964	24,933	2,645	428,626
Combined Shipments								
Bulk and General Cargo	15,878	21,279	1,736	488,330	1,013,782	1,332,165	2,645	2,875,815
GRAND TOTAL RECEIPTS AND SHIPMENTS:								
Bulk Cargo	215,949	56,218	87,682	1,361,230	12,135,530	5,262,821	12,500	19,131,930
General Cargo	16,898	41,150	6,570	778,390	150,640	24,939	12,470	1,031,057
Gross Commerce	232,847	97,368	94,252	2,139,620	12,286,170	5,287,760	24,970	20,162,987

The bulk of the trade by water through the ports of the Chicago Region is domestic. There is some foreign trade, however, chiefly with Canada, and principally out of Calumet and Chicago Harbors, as shown by the following statistics for the calendar year 1925:

FOREIGN WATERBORNE COMMERCE OF THE CHICAGO REGION—1925—TONS

PORTS	CHICAGO	SO. CHICAGO	INDIANA HARBOR	TOTAL
Animals and Animal Products:				
Fish	979	.....	.....	979
Vegetable Food Products:				
Flaxseed	11,664	.....	.....	11,664
Other	3,759	9,143	.....	12,902
Textiles:				
Burlap	237	.....	.....	237
Other	187	.....	.....	187
Wood and Paper Products:				
Newsprint	36,964	.....	.....	36,964
Lumber	7,810	.....	.....	7,810
Wood Pulp	762	.....	.....	762
Non-Metallic Minerals:				
Glassware	346	.....	.....	346
China Clay	2,688	.....	5,400	8,088
Other	2,243	.....	.....	2,243
Ores, Metals and Manufactures of:	247	.....	.....	247
Unclassified	546	.....	.....	546
Total	68,432	9,143	5,400	82,975
EXPORTS				
Vegetable Food Products:				
Wheat	18,023	46,453	.....	64,476
Corn	1,344	12,767	.....	14,111
Rye	3,010	3,885	.....	6,895
Oats	27,317	20,353	.....	47,670
Glucose	135	.....	.....	135
Barley	.....	1,290	.....	1,290
Flour	.....	35	.....	35
Other	2,705	.....	.....	2,705
Binder Twines	13,552	.....	.....	13,552
Ores, Metals and Manufactures of:	7,247	60,649	9,046	76,942
Machinery and Vehicles	627	.....	.....	627
Unclassified:	1,572	818	.....	2,390
Total	75,532	146,250	9,046	230,828
Total Foreign Trade	143,964	155,393	14,446	313,803

Most of the inbound cargo is for use in the Chicago Region; by far the bulk of it for consumption by the steel industry. A small amount of coal is transshipped, some 200,000 tons of anthracite being interchanged with rail for consumption in the interior. On the other hand, the bulk of the outbound movement consists of rail-lake interchange, two-thirds of which is grain from the interior.

ENTRANCE TO CALUMET RIVER

FREIGHT RATES

FOREIGN TRADE

Rail rates from an interior point to different ports on the seaboard are not necessarily the same. Differentials have been established which are intended to retain for certain ports the advantages of their geographical locations. The rates from Chicago to Boston and New York, for instance, are the same; to Philadelphia they are two cents per 100 pounds less than to New York; to Baltimore the differential is three cents.

One might expect to find the reverse true with respect to ocean rates, but such is not the case. Boston is 175 miles nearer Europe than New York; New York is 150 miles nearer than Baltimore; but in spite of this ocean rates are the same for they are independent of such small differences in distance.

The St. Lawrence Waterway might be expected to serve as a highway for foreign trade for all points for which the rail rate to a port on the Great Lakes plus the ocean rate proves to be less than the sum of the existing rail rate to a port on the seaboard and the ocean rate from that port. The only unknown quantity in solving such a problem is the probable ocean cost from the different lake ports, for the existing rail rates are known and the existing ocean rates may be averaged.

Perhaps the best way of estimating future ocean rates from lake ports is by considering differentials which exist between the North Atlantic Ports, the Gulf Ports, and the South Atlantic Ports. From the Gulf Ports to the United Kingdom the distance is some 5300 miles; from New York it is about 3600 miles; from Chicago by way of the Great Lakes and the St. Lawrence River the distance is about 4300 miles. Referred to New York the distance of the Gulf Ports from Great Britain is about 45% greater, and of Chicago it is about 20% greater. The rates from the Gulf Ports, however, are only 20 percent greater than those from New York.

It is apparent that these differentials are somewhat arbitrary and not a function of the distance; but it is likely that rates to Chicago will be subjected to a differential which approximates that of New Orleans on account of the short navigation season and the delays to shipping in the connecting channels.

Probably the bulk of the foreign trade of the area tributary to the Great Lakes Ports will be with northern Europe, though it is more likely that a comparative rate situation applying to the Mediterranean trade will represent average conditions. Compared to New York rates on general cargo to Mediterranean ports, those from Chicago probably will be 20 percent greater; from Cleveland, they will be about 12 percent greater. Applying these percentages to the average ocean rates out of New York, the costs from Chicago to foreign destination will approximate five cents per 100 pounds more than from New York and from Cleveland they will be about three cents greater. This rate situation would operate so that goods having a land rate differential of five cents in favor of Chicago would move for export via Chicago instead of by way of New York, while for Cleveland the critical land differential would be three cents.

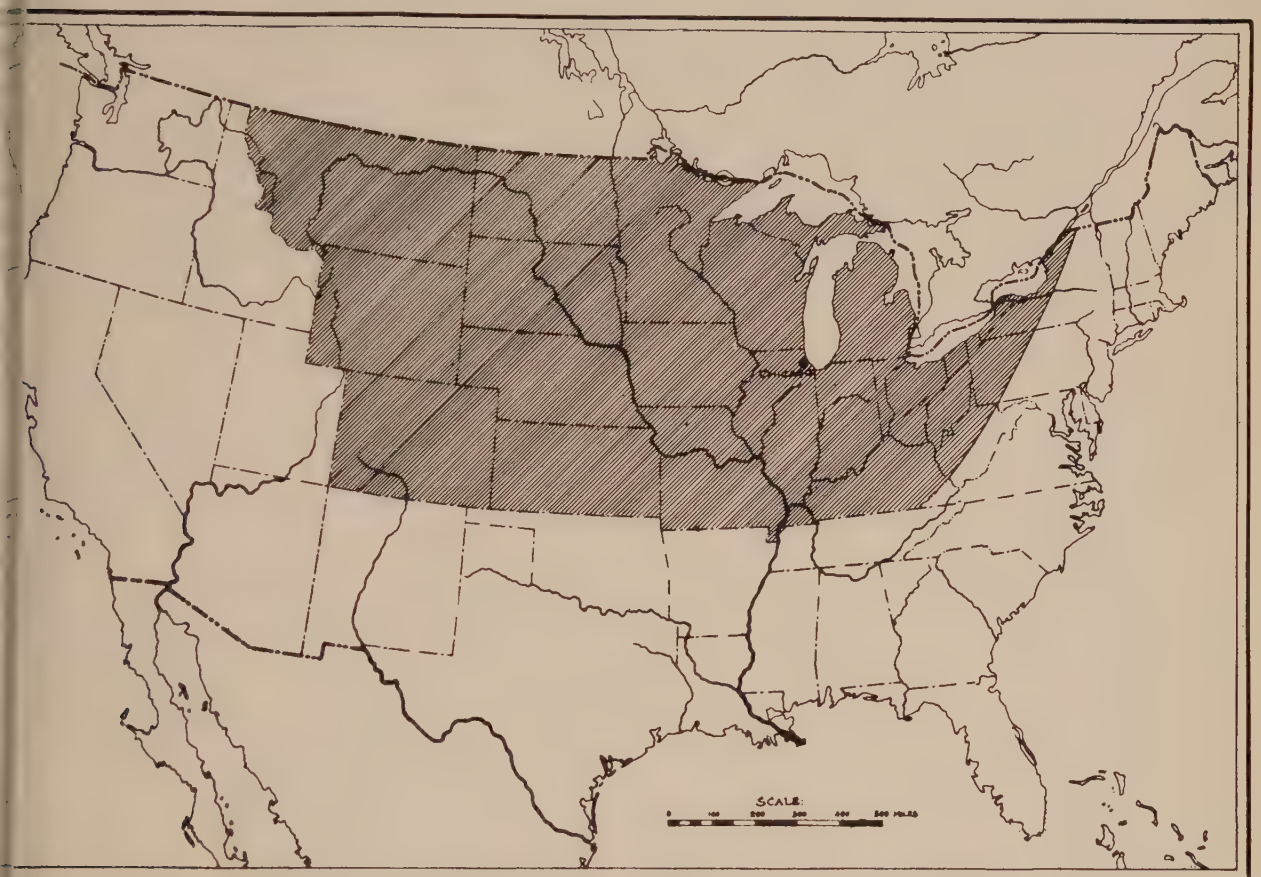
Knowing the land rate differentials it is possible to determine approximately the boundaries of the area tributary to the Great Lakes for foreign trade.

It is likely that there will be some foreign trade through Chicago by way of the Lakes-to-the-Gulf Waterway. The Mississippi-Warrior Service of the Federal Barge Line now makes available an export water rate which is about 80 per cent of the corresponding all rail rate between interior points on the Mississippi River and the Gulf, and there is a small amount of this class of traffic out of Chicago at present.

The Great Lakes now serve largely as an alternate route to the seaboard for a limited number of commodities, principal among which is grain. For the Lake Superior ports this alternate route carries over 90 percent of the eastbound grain movement; for the Lake Michigan ports the percentage is about 36.

The general cargo trade to the seaboard by way of the Great Lakes is in very much the same situation, the Lake Superior ports obtaining a larger percentage of traffic. For a long time inter-lake package freight service was operated by the railroads; both rail rates and lake rates were considerably lower than they are now, and a larger differential both absolute and proportional, existed between them. The so-called Panama Canal Act required the railroads to relinquish their boat lines,

in the readjustment which followed the boat ices to Duluth-Superior retained a comparative- rge differential while those to Lake Michigan d theirs reduced. As a result the volume of class of traffic between Lake Michigan ports eastern points has been seriously decreased. has been advanced by local interests that this -rail differential should be increased, for while the unit profit to the boat lines would be decreased correspondingly, the gross profit would be larger on account of the greater volume of trade. There is little question but that a greater volume of trade would result from a larger differential, for in this way the disadvantages of an inferior service would be overcome. Experience only would show whether the boat lines would profit by this change.



DOMESTIC AREAS TRIBUTARY TO GREAT LAKES PORTS FOR FOREIGN TRADE.

OMESTIC COASTWISE TRADE

There are several classes of domestic coastwise de in which Chicago has a direct interest and for ich the rate situation requires consideration. ese are Lake Michigan and inter-lake trade, stwise trade by way of the Lakes-to-the-Gulf aterway—ex-New Orleans, and coastwise trade way of the St. Lawrence Waterway.

Lake freight rates between Chicago and points the west shore of Lake Michigan follow closely rail rate, being approximately ten percent under it. On cross lake service the lake rate generally equals the rail rate. Inter-lake rates are subject to the difficulties just discussed under Foreign Trade; they follow the rail rates so closely that the shipper is not compensated for the inferior service. An increase in the differential should stimulate this class of trade, and might put the boat lines in a position to provide better service.

Coastwise trade by way of the Lakes-to-the-Gulf Waterway with interchange at New Orleans will be controlled by the differential existing between

the rates for the different services available. This class of traffic will therefore be limited, undoubtedly, to service to Pacific Coast ports where the long cross country rate is comparatively high.

Domestic coastwise trade by way of the St. Lawrence River will find a rate situation similar to that developed in the case of foreign trade, complicated somewhat, however, by the addition of a short rail haul at the other end of the water route.

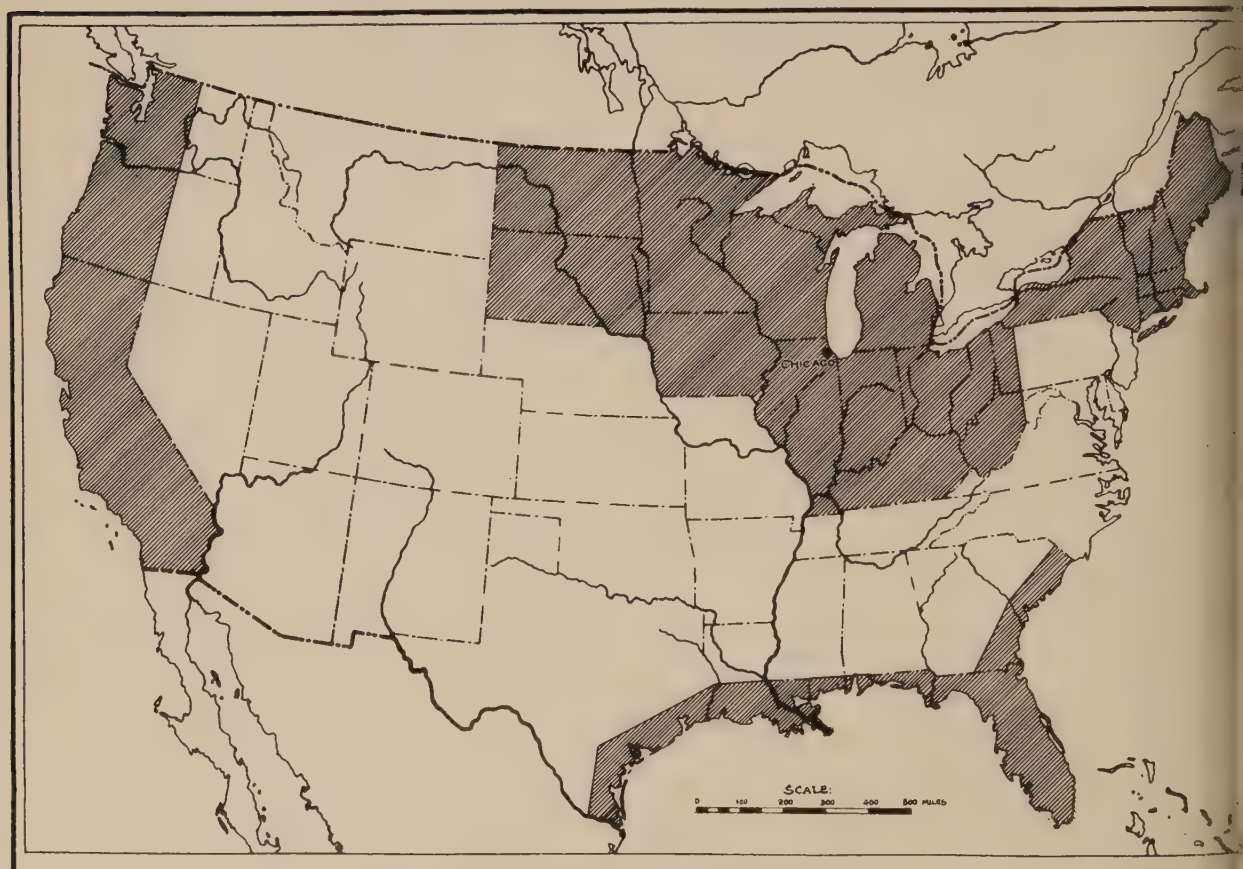
The approximate boundaries of the area which may be tributary to the Great Lakes for coastwise trade in general cargo after the St. Lawrence Waterway is completed are shown graphically in the accompanying map. The area which is now tributary for domestic trade is included.

INLAND WATERWAY TRAFFIC

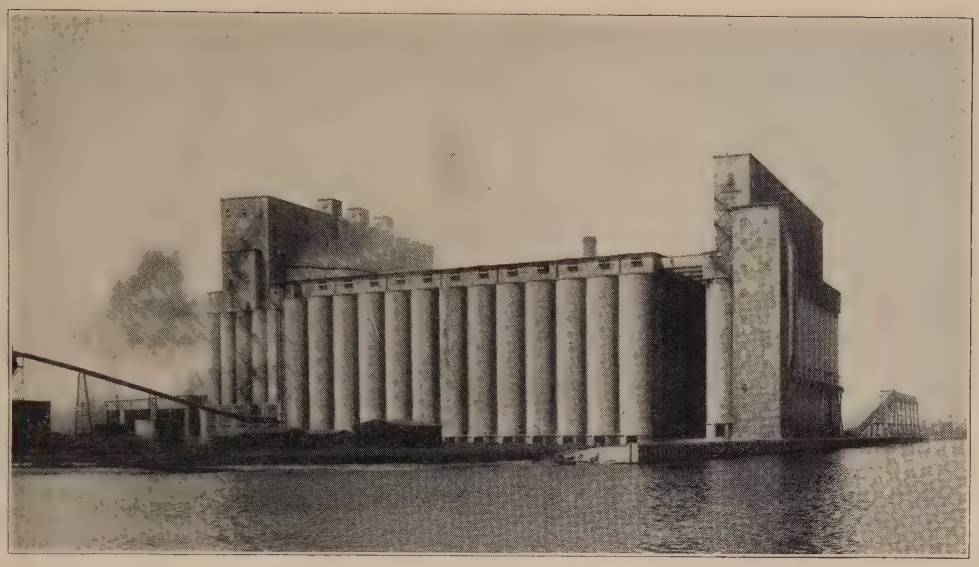
For freight taking class rates it is likely that the barge services to be established on the Lakes-to-the-Gulf Waterway will follow the example set by the Federal Barge Line and quote all water or joint rates of which the part performed by the Barge Line will carry about 80 percent of the corresponding rail rate.

The experience of the Federal Barge Line indicates that where the water haul is not too long compared to the alternate rail haul, territory some distance back from the river may be served. But the cost of water transportation over long distance is largely a function of the distance so that there is a limit beyond which joint rail and water costs would exceed those by an all-rail route.

The territory which might be expected to be tributary to Chicago for inland waterway traffic in general cargo is shown in the accompanying ma



DOMESTIC AREAS TRIBUTARY TO GREAT LAKES PORTS FOR COASTWISE TRADE.



NORTHWESTERN ELEVATOR—CALUMET RIVER

DOMESTIC AREA TRIBUTARY TO CHICAGO BY BARGE WATERWAYS.

COMMODITY TRAFFIC

LUMBER, AND OTHER TIMBER PRODUCTS

Chicago is the principal lumber market of the middle west and one of the largest in the country. During the year 1926 receipts amounted to about four billion feet and shipments to about two billion, the remaining two billion feet being consumed locally.

About 40 percent of the lumber received at Chicago comes from states in the lower Mississippi Valley, and almost the same amount from the Pacific Coast. Thus three-fourths of the lumber received at Chicago comes from points tributary to the lower Mississippi River, either directly, by short rail haul, or by water from the Pacific Coast through the Panama Canal.

With the exception of a negligible amount of lumber coming by lake from northern Michigan and Wisconsin and from Georgian Bay ports in Canada, all of the receipts at Chicago come by rail. The lake movement now averages less than ten million feet annually.

Within 50 miles of the Mississippi River, in the states of Tennessee, Arkansas, Mississippi, and Louisiana there is a daily combined capacity of saw mills of three times the average daily receipts of southern lumber in Chicago. Investigation of joint rail and water rates to Chicago, additional terminal costs included, indicates that there will be a differential in favor of water movement if a back downstream haul of some other commodity is provided. Investigations of other commodities indicate that downstream movements will be available for return cargo.

The Louisiana-Texas Intracoastal Waterway, now under improvement by the U. S. Government to a depth of 9 feet, will make an all water route to Chicago available from a district which produces large quantities of lumber.

Pacific Coast Lumber, arriving at New Orleans by ship, might move to Chicago by an all water route; for there will be a decided differential in favor of such a movement if a back haul is available.

GRAIN

Grain received at Chicago is either consumed locally, shipped to consuming centers in the east or shipped east for export.

Practically all of the grain received at Chicago comes by rail, though a small amount is occasionally brought in by lake vessel in connection with marketing operations.

The following figures include grain which may be manufactured locally into flour, etc. and shipped out.

Receipts of Grain and Flour at Chicago (000 Omitted).

	1921	1922	1923	1924	1925	1926	Aver.
Wheat—bu.	45 700	57,850	52,489	69,012	28,244	38,113	48,5
Corn—bu.	182,982	193,271	105.505	99,524	83.557	92,710	126,2
Oats—bu.	82,729	87,141	75,106	82,831	53,547	47,243	71,4
Rye—bu.	4,215	5,534	5,380	9,672	5,895	2,163	5,4
Barley—bu.	7,763	9.938	9,835	11,461	9,833	9,032	9,6
Total Grain—bu.	323,389	353,734	248,315	272,500	181,076	189.261	261,3
Flour—bbls.	10 911	13,729	11,616	12,253	13,009	12,907	12,4

Consumption of Grain and Flour at Chicago.

	1925	1926
Wheat—bu.	9,726,000	6,406,0
Corn—bu.	43,007,000	40,786,0
Oats—bu.	14,009,000	15,418,0
Rye—bu.	172,000	1,628,0
Barley—bu.	6,700,000	7,149,0
Total—bu.	73,614,000	71,387,0
Flour—bbls.	6,293,000	6,098,0

SHIPMENTS OF GRAIN AND FLOUR FROM CHICAGO (000 OMITTED).

	1921	1922	1923	1924	1925	1926	AVERAGE
at—bu.	41,073	49,595	29,140	60,531	23,233	32,131	39,284
—bu.	117,113	117,966	57,602	44,066	38,839	39,232	69,136
—bu.	58,927	69 302	50 649	42,173	42,853	36,678	50,097
—bu.	3,857	5,335	3.340	6,918	5,819	2,292	4,593
ey—bu.	4,297	3,302	3,354	4,141	2,410	2,453	3,325
l Grain—bu.	225,467	245,410	144,085	157,829	113,154	112,786	166,455
r—bbls.	7,722	10,647	8,144	7.373	7,783	8,671	8,390

RECEIPTS AND SHIPMENTS OF GRAIN AT CHICAGO.

	RECEIPTS PRACTICALLY ALL RAIL (BUSHELS)	SHIPMENTS	
		LAKE (BUSHELS)	RAIL (BUSHELS)
	323,389,000	127,526,000	97,941,000
	353,734,000	97,062,000	148.358,000
	248,315,000	35,016,000	109,069,000
	272,500,000	74,036,000	83,793,000
	181,076,000	41,885.000	71,269,000
	189,261,000	50,030,000	62,756,000
rage	261,380,000	70,924,000	95,531,000

The consumption of grain at the eastern centers ies between 200,000,000 and 250,000,000 bushels ually. United States exports of grain of all ds have averaged in the vicinity of 300,000,000 hels a year since 1919. From one-half to two- rds of this export grain moves out of the North antic ports. There is therefore an export and nestic market of from 350,000,000 to 450,000,000 hels of grain a year which is competed for by western primary grain markets.

There is a much larger world grain market for ich to compete than the figures of the United States exports would show. Participation in this larger market is determined by transportation costs.

A large part of the grain that moves out of Chicago by water is carried by deep-draft vessels to Buffalo, where it is unloaded into elevators and reshipped to New York and other eastern ports by railroad, or by barge over the New York State Barge Canal. Another route is by way of Georgian Bay ports, where the grain is reshipped by rail, either to Montreal or to points in New England. Next to the movement through Buffalo, the heaviest shipments are by the all-water route to Montreal.

COST OF MOVING WHEAT TO EUROPE FROM CHICAGO—(CENTS PER BUSHEL) 1923

TE	LAKE RATE	RAIL RATE	OTHER INLAND WATERWAY RATE	ELEVATION, ETC.	OCEAN RATE	TOTAL
ce to Buffalo—rail to New York	3.0	9.1	.....	2.0	8.0	22.1
ce to Georgian Bay—rail to Montreal	3.0	8.6	.....	0.2	8.0	19.8
ce and Canal to Montreal	3.0	.....	6.0	0.2	8.0	17.2
ce to Buffalo—Canal to New York	3.0	.....	7.0	1.5	8.0	19.5
il to New York	.....	13.5	.....	1.0	8.0	22.5

DOMESTIC RATES ON GRAIN FROM CHICAGO TO NEW YORK (CENTS PER BUSHEL)

TE	LAKE RATE	RAIL RATE	INLAND WATERWAY RATE	ELEVATION ETC.	TOTAL
ke to Buffalo—Rail to New York	3.0	12.5	.....	1.0	16.5
rail to New York	.....	18	.....	.....	18

There is no grain movement from Chicago to New Orleans for export. The ocean rates from New Orleans to Liverpool are from one to three cents higher than from New York, while the all rail rates to New Orleans and the rail and barge rates are considerably higher than those to the Atlantic Coast ports.

There are several projects, under way or contemplated, that may affect the cost of moving grain from Chicago to the seaboard. The first is the new Welland Canal, which will permit deep-draft lake vessels to pass between Lake Erie and Lake Ontario.

The proposed deepening of the principal harbors and inter-lake channels to 25 feet, a project now under investigation by the War Department, should have the result of reducing lake transportation costs.

The completion of the Lakes-to-the-Gulf Waterway will have some effect upon the movement of grain to the seaboard. Where a return cargo is available there will be a differential in favor of shipping by barge to New Orleans, but this requirement of back haul undoubtedly will operate to keep the downstream movement of grain from assuming very large proportions. It may also prevent the establishment of large rail-to-barge grain transfer facilities on the Illinois or upper Mississippi rivers.

The St. Lawrence River improvement is more likely to affect radically the movement of grain through Chicago than any other project under way or proposed. With deep draft navigation from the upper lake ports to the seaboard, large lake vessels may carry full cargoes of grain all the way to Montreal and ocean vessels of average dimensions may enter the lakes, proceed to Chicago, Milwaukee, and Duluth and receive return cargoes of grain.

SAND, GRAVEL AND CRUSHED STONE

Due to prevalence of large deposits of sand and gravel and outcroppings of rock suitable for building purposes, the movement of those materials is largely a local one. Approximately 80% of the requirements of the Chicago market are supplied from sources within the Chicago Region. Short hauls prevail and so, in spite of the fact that these materials lend themselves to mechanical handling and may move in bulk, shipments by rail predominate over those by water in the order of about 6 to 1.

PRODUCTION OF SAND, GRAVEL AND STONE IN CHICAGO DISTRICT, 1925.

SHIPPERS	SAND TONS	GRAVEL OR STONE—TONS	TOTAL TONS PRODUCED
Dolese & Shepard Co.	0	900 000	900,000
Consumers Co.-Lemont	0	500,000	500,000
Consumers Co.-McCook	0	842,750	842,750
Consumers Co.-Algonquin	225,700	149,200	374,900
Brownell Imp. Co.	0	2,330,069	2,330,069
South Elgin Sand & Gravel Co.	200,000	100,000	300,000
Chicago Gravel Co., Neal Gravel Co. and Inner Zone	2,161,761	2,653,910	4,815,671
	2,587,461	7,475,929	10,063,390
	26%	74%	100%

CONSUMPTION OF SAND, GRAVEL AND CRUSHED STONE IN THE CHICAGO MARKET, 1925.

	TORPEDO SAND	GRAVEL OR STONE	TOTAL TONS
Chicago District Quarries and Inner Zone Pits	1,701,469	4,035,144	5,736,613
Indiana and Wisconsin Pits	1,616,465	762,835	2,379,300
Total Tons	3,317,934	4,797,979	8,115,913
	41%	59%	100%

To the above should be added 1,000,000 tons from other sources and by truck, and the water-borne tonnage, which in 1926 was around 1,500,000 tons.

Receipts of Construction Materials by Water in the Chicago Region, 1926.
(Tons of 2,000 lbs.)

	Chicago River	Calumet River	Indiana Harbor	Total
l				
rom Michigan Shores	154,500	79,350		233,850
rom Indiana Shores	390,136	263,350	302,000	955,488
rom Waukegan to 43rd St.	625			625
vel				
rom Michigan	8,200			8,200
shed Stone				
rom Lemont via Drainage Canal	338,915			338,915
Total Receipts				1,537,078

Rail transportation has the advantage over water hat it has greater flexibility as to points of de- ry, hence the secondary haul by truck from rage yard to consumer is usually enough shorter offset the advantage enjoyed by water transpor- on of cheaper production and cheaper trans- tation costs between pits and local river yards. Any material decrease in the margin between rail l water costs would reduce the size of the zones outary to the river yards and consequently the rket for materials brought in by lake vessel. It uld not affect the general market price in the icago District.

The movement of these materials into the Chi- go District by lake has been increasing rapidly; is is largely due to the fact that this business is mparatively new and has not reached a state of uilibrium.

The completion of the Illinois Waterway is likely put a stop to any material increase in the lake nd and gravel business; it may even make serious roads upon it. Large sand and gravel pits below oliet are located on the Des Plaines River. Direct ading of barges by dredges will be feasible, and aterials may be brought into Chicago in carriers hich are much more flexible than the lake vessels, nd with a margin of saving which certainly will ave an effect upon this lake traffic.

PETROLEUM AND PETROLEUM PRODUCTS

Chicago early attracted the attention of oil men, both as a consuming market and as a distributing center. Low cost of land, with rail and water transportation available, induced the industry to become grouped along the shore of Lake Michigan, in Indiana, close to Chicago.

Pipe lines from the Illinois and Mid-Continent fields conduct the raw petroleum to the refineries in the Chicago District. Refining operation in this area now approximates 110,000 barrels daily.

Most of the production takes place in three large plants, as follows:

	Daily Capacity—bbls.
Standard Oil Company	52,000
Sinclair Oil Company	24,000
Roxana Petroleum Corporation	18,000

There is also the plant of the Texas Oil Company at Lockport, Illinois, with a daily output of 4,500 barrels. There are many other smaller plants, but most of them do only limited processing and are of little significance in the general situation.

A comparative newcomer is the Bartles-McGuire Oil Company of Milwaukee which has established two units of a daily capacity of 1000 barrels each with others to follow. This company does limited processing, but plans to ship its products

Movement of Petroleum Products on Great Lakes—1923.
Tons (2,000 lbs.)

Port	Imports	Exports	Domestic Receipts	Domestic Shipments
Duluth-Superior	0	0	116,944	0
Green Bay	0	0	68,292	0
Muskegon	0	0	234,420	0
ndiana Harbor	0	0	0	748,535
Detroit	0	0	370,414	0
Toledo	0	38,913	0	0
Total	0	38,913	790,070	748,535

from its wharf on the Indiana Harbor Canal to its distributing station in Milwaukee.

The local consumption of gasoline and light oil varies from 15,000 to 25,000 barrels a day. The balance of the production of the local refineries is shipped out in tank wagon, tank car and lake vessel. At present only the Standard Oil Company utilizes lake vessels for the partial distribution of its products, though it is understood the Roxana Petroleum Corporation proposes the erection of distributing stations at Detroit, Toledo, Cleveland and Buffalo, to be reached by boat.

There has been a very rapid growth in the consumption of petroleum products in the past few years, and the production in the Chicago District has kept pace with that growth. On the other hand the movement by lake has not experienced the same rate of increase, indicating there is inertia in establishing this method of distribution which takes time to overcome. As a result, while the growth in consumption may not continue at the same advanced rate the increase in volume of lake shipments may be protracted for a longer period.

BITUMINOUS COAL

Shipments of bituminous coal via the Great Lakes amounted to 27,863,000 short tons in 1925, including vessel fuel. Of this total about 84 per cent went to the United States ports and 16 per cent to Canadian destinations.

The greater part of the coal moving on the lakes goes from the Ohio, Pennsylvania, West Virginia and Eastern Kentucky fields by rail to Lake Erie ports, via lake to Lake Michigan and Lake Superior ports, thence to destination by rail. This west bound coal furnishes return cargoes for some of the grain and ore vessels which discharge at Lake Erie ports and consequently a comparatively low freight rate by lake prevails.

Bituminous Coal Shipped Via All Routes to Chicago District—Tons.

Year	Indiana	Illinois	Western Kentucky	Crescents	Ohio	Total
1923	5,522,623	13,358,355	519,337	12,099,464	100,051	31,599,830
Percent	17.48	42.27	1.64	38.29	.32	100.00
1924	3,800,996	11,829,611	563.017	12,915,051	71,104	29,599,830
Percent	13.02	40.54	1.93	44.26	.25	100.00
1925	3,804,840	10,892,791	1,326,920	15,577,905	55,856	31,658,312
Percent	12.01	34.41	4.19	49.21	.18	100.00
1926	3,785,615	10,737,355	1,880,183	16,595,224	27,122	33,025,499
Percent	11.46	32.51	5.69	50.25	.09	100.00

Coal Transfer and Storage Facilities—Calumet River

e largest consumers of bituminous coal in the ago District are on the waterfront. Among are the steel mills, the by-products coke and gas plants, and the electric power generating ons. At present, however, only the indepen-dent steel companies and one large by-product coke company receive coal by lake as the others use coal which is not tributary to the lake routes or which is brought in by railroads in which the consumers are interested.

Receipts of Bituminous Coal by Lake at Ports in Chicago Region—Tons.

	1910	1924	1925	1926
e	88,062	234,886	184,229	Not available
sha	24,733	16,639	12,925	" "
egan	61,954	40,250	64,565	" "
go		69,140	62,160	" "
Chicago		853,585	1,410,172	2,200,000 (Preliminary)
na Harbor		1,123,416	1,280,205	1,500,000 (Preliminary)
gan City				
otal	174,749	2,337,916	3,014,256	4,000,000 (Estimated)

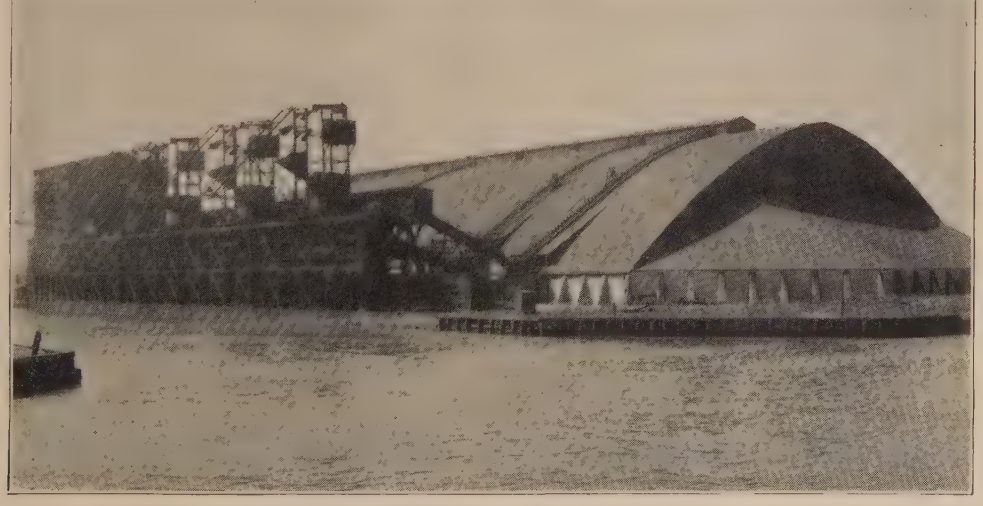
he bituminous coal received at Racine, Ken- and Waukegan is largely for local consump- by various industrial users. That received at ago is for bunkering lake vessels. Practically f that received at South Chicago and Indiana bor is used for making coke, largely for con- otion in the blast furnaces.

is believed that the present rate situation is rable to a continued and material increase in volume of coal receipts in the Chicago Region ake. There is a large and growing demand for in grades of eastern coal used in the produc- of metallurgical and gas house coke that is kely to be affected by any change in prices of r grades of coal from midwestern fields.

ichigan City, Indiana, is some 375 miles from eastern Kentucky coal fields as compared with miles for Toledo. If a rail rate from these s to Michigan City were allowed which compared favorably with that to Toledo a considerable portion of the Lake Michigan coal trade could be handled through Michigan City instead of by way of the Lake Erie ports.

Another development which would be likely to affect the movement of coal through the Chicago Region would be the establishment of facilities for the receipt by rail and shipment by lake of coal from the Danville fields of northern Illinois. Investigation leads to the conclusion that this coal may be delivered at Duluth by rail and lake through Chicago at a price slightly less than that asked for the delivery of eastern coals there.

The completion of the Illinois Waterway will have some effect upon the movement of coal into the Chicago Region by water, but only to a limited degree as most of the important coal deposits in Illinois are some distance from water and short rail hauls from mine to waterfront will be required.



Abandoned Anthracite Terminal—Calumet River

ANTHRACITE

Most of the anthracite produced in this country is mined in the fields of Pennsylvania which are confined to a very limited area in the northeastern and eastern part of the state. It is significant that while the production of anthracite doubled between 1890 and 1913 there has been no consistent increase since the latter date.

The bulk of the anthracite mined is consumed east of the Allegheny Mountains. Perhaps five per cent of the production is exported, largely to Canada, and about seven per cent is shipped west of the Alleghenies.

Railroads serving the anthracite trade regions, together with their western connections, handle most of the coal mined. A large tonnage is moved by rail to Lake Erie ports for lake shipment to Canadian ports and to Lake Michigan and Lake Superior ports in the United States. While this movement has been an important one in the past, the business has been steadily declining in recent years.

This general decline in consumption of anthracite in the northwest has been attributed partly to the fact that these regions are more remote from the mines than the eastern markets and consequently are more completely shut off from the use of this fuel during strike periods.

There has been a more marked decline in use of this fuel in the Chicago Region. This is probably the result of the fact that Chicago is in much better contact with more varieties of substitute fuels.

LAKE TRAFFIC IN ANTHRACITE—CHICAGO REGION —TONS

PORT	1910	1920	1925
Racine	55,160	0	14,852
Kenosha	18,168	0	980
Waukegan	123,869	29,990	23,117
Chicago	840,341	389,170	160,357
South Chicago	741,599	115,808	57,071
Indiana Harbor	0	0	0
Michigan City	0	0	0
Total	1,779,137	534,968	256,377

Among the various reasons to which has been attributed the rapid decline of receipts of anthracite by lake, the principal and practically all-inclusive cause might be stated as the negligible saving in all-around costs of transportation between mine and consumer.

The combined effect of increased costs of unloading, storage and degradation is to reduce the apparent lake-rail differential of $1.54 a ton to about $0.50 a ton. This small margin must therefore cover increased costs of delivery from river yards to consumers, and accordingly the local territory that may be reached from river docks is very restricted.

The conclusion is more or less inevitable that the receipt of anthracite by lake is no longer a factor in the local market, and no foreseeable change is likely to make it so.

IRON ORE

The Lake Superior region ranks first in the world as an iron ore producer, containing an estimated 1,500,000,000 tons of metallic iron in higher grade, readily available reserves, and an almost unlimited quantity of lower grade ore. The visible supply of

THE LAKE SUPERIOR IRON ORE RANGES

RANGES	LOCATION	ESTIMATED RESERVES IN 50% ORE-1925 TONS	PRODUCTION IN 1923 TONS	LAKE SHIPPING POINTS
Mesabi—	Between Duluth and the Vermilion Range—40 miles from Duluth, Minnesota	1,250,086,000	41,806,230	Two Harbors, Duluth, Superio
Gogebic—	Gogebic County, Michigan. Iron and Ashland Counties, Wisconsin	52,026,000	6,579,730	Ashland, Marquette, Escanab
Menominee—	South of Marquette Range in Michigan and Wisconsin	67,184,000	4,855,370	Marquette, Escanaba
Cuyuna—	60 miles west of Duluth, Minnesota	52,124,000	2,220,733	Superior, Duluth
Vermilion—	St. Louis, Lake and Cook Counties, Minnesota	13,539.000	1,278,684	Two Harbors, Duluth
Marquette—	Marquette County, Michigan	68,988,000	3,891,801	Marquette, Escanaba
	Total	1,503,947,000	60,632,548	

er cent or better ore is good for 20 or 30 years e present rate of use, but due to refinements in ufacturing, as well as the discovery of new re- es, it is likely that the higher grade ores will for a considerably longer period.

f the iron ore produced during the season of about 1,600,000 tons moved to its final destina- by all rail routes, the entire balance (about 00,000 tons) went by rail to the upper lake ports, thence down the lakes for consumption at the receiving ports or for rail movement to the interior.

Of these shipments Lake Erie ports received 44,500,000 tons and Lake Michigan ports nearly 13,000,000 tons. The ore delivered to Lake Erie ports is largely transhipped to interior steel districts in Ohio and Pennsylvania. That delivered to Lake Michigan ports is largely consumed by blast furnaces on the waterfront.

RECEIPTS OF ORE BY WATER AT PORTS IN CHICAGO REGION—SHORT TONS

PORT	1910	1923	1924	1925	1926*
ago	114,558	0	0	5,266	0
h Chicago	5,381,014	6,960,000	5,127,746	7,387,755	7,144,300
na Harbor	0	1,677,700	1,774,817	2,132,812	2,815 960
	1,960,000	4,400,000	No record	5,420,000	5,390,000
Total	7,455,572	13,037,700		14,945,833	15,320,260

inary Estimates.

POINTS OF CONSUMPTION OF ORE—CHICAGO DISTRICT

NAME OF PLANT	LOCATION	NUMBER OF BLAST FURNACES
ndiana Steel Co.	Gary	12
nland Steel Co.	Indiana Harbor	4
Youngstown Sheet & Tube Co.	Indiana Harbor	2
Youngstown Sheet & Tube Co. (Iroquois)	South Chicago (River Mouth)	5
llinois Steel Co.	South Chicago (River Mouth)	11
Visconsin Steel Co.	South Chicago, 107th Street	3
Federal Furnace Co.	South Chicago, 107th Street	2
llinois Steel Co.	Joliet	4

here appears to be every indication that the ement of ore into the Chicago Region by lake continue to increase for a number of years. ctically all of the steel companies have projects expansion which will involve substantial addi- s to their receipts of ore. Most of them have sed tracts of land and dock space adjacent to r present locations which can be developed as uired. One large independent producer has been roving a site for a new steel plant on the Indi- Harbor Canal. The market for steel products he middle west is increasing rapidly, and the ago steel producers seem to have a firm grip he territory.

LIMESTONE

imestone is used in large quantities for fluxing oses in the manufacture of iron and steel. The cipal source of this material is at Calcite, Mich-, on Lake Huron, though there are quarries where which are of minor importance in the e. These quarries are so situated that direct ing of vessels from both the screening and hing plants and the stock piles is practicable.

There was no lake traffic in fluxing stone of record in 1910. In 1924 approximately 2,300,000 tons were received at the waterfront steel mills in the Chicago Region, 2,900,000 in 1925, and 3,000,000 in 1926. This traffic is distributed in approximately the same proportions as the ore that is received by water. Part of it is unloaded by the same equipment, and increasing quantities by modern self-unloading vessels.

IRON AND STEEL

Coincident with the growth in manufacture of basic pig iron in the Chicago Region there has been a corresponding growth in the volume and value of iron and steel products, such as plate, tubes, pipe, rails and structural shapes of various kinds. Steel makers in Chicago have been in direct competition with those in the Pittsburgh district from the very beginning, but in the midwestern territory they now have the advantage of being nearer the market as well as having a better location with regard to raw materials.

In 1910 the shipments of iron and steel by water from the public harbors in the Chicago Region were about 19,000 tons; in 1924, 37,500 tons; in 1925, 87,000 tons. The preliminary estimate for 1926 was 200,000 tons. These figures do not include shipments from Gary, for which published statistics are not available. The tremendous growth of the iron and steel industry is apparent from the following:

VALUE OF PRODUCTS—METAL TRADES—CHICAGO REGION

	1914	1925
Blast Furnaces	$ 41,749,288	$157,300,664
Rolling Mills	100,061,843	355,992,030
Bolts, Nuts and Rivets	1,624,561	11,132,289
Forgings	2,674,078	17,710,876
Doors and Shutters	750,000	2,700,000 est.
Nails, Spikes, etc.	678,000	2,786,000
Steel, processed and welded	250,000	1,000,000
Electrical Machinery, Apparatus and Supplies	107,603,492	387,693,652
Foundry and Machine Shop Products	65,237,154	181,471,581
Hardware	9,435,480	34,316,470
Machine Tools	Not separated	5,812,474
	$330,143,896	$1,157,996,036

As the population of the cities on Lake Michigan and Lake Superior increases the market for iron and steel products tributary to the Chicago district by water will increase and in like measure the shipments by water.

The completion of the Illinois Waterway will bring the river cities as far south as Vicksburg and perhaps Baton Rouge and some of the territory back of them into the Chicago market. These points are now tributary to Pittsburgh. There is a movement of iron and steel products on the Ohio and lower Mississippi rivers, approximately 125,000 tons being received at the more important Mississippi River ports during 1925.

In 1925 over 1,900,000 short tons of iron and steel products were exported from the United States, one-third of which went to Canada. The Canadian territory is reached by Chicago manufacturers. At present 10 per cent of the total United States exports to Canada have been shipped from South Chicago by water. The opening of the St. Lawrence Waterway will put Chicago in better communication with the larger market in eastern Canada. It will also give Chicago manufacturers direct access by water to the other export markets of the world.

MISCELLANEOUS

NITRATES. Nitrate is a very important element in most forms of fertilizer. It is used in large quantities in the United States, and is largely imported from Chile.

In 1925 nearly 1,400,000 tons of nitrates and nitrogenous materials were entered at the various ports of the United States, of which over 1,100,000 tons came from Chile.

This commodity is more likely to reach our interior agricultural districts via New Orleans and the Mississippi System of Waterways than via the St. Lawrence Waterway and Great Lakes ports. The only states tributary to Chicago for trade of this character are parts of Michigan and Wisconsin.

PHOSPHATES. Phosphate rock is a raw material used for the manufacture of fertilizer. Sometimes it is used in the raw state, the rock being ground finely and applied to the soil. In the United States acid phosphate is produced more cheaply, sulphuric acid being combined with the phosphate rock in its manufacture.

Florida and Tennessee produce most of the phosphate rock in this country; Florida's production in 1923 being over 2,500,000 long tons; that of Tennessee being about 430,000 tons.

The phosphate rock quarries in Tennessee are mostly situated where they could reach either the Tennessee or Cumberland rivers by short rail haul, but this material is not likely to move to Chicago by barge unless a return cargo of some sort is available at least part way. The rock produced in Florida could be shipped via the St. Lawrence River after it has been deepened.

SULPHUR. Sulphur is produced in large quantities at points in Louisiana and Texas readily accessible to the Louisiana-Texas Intra-Coastal Waterway. As this waterway joins the Mississippi a short distance above New Orleans, an all water shipment of this commodity to Chicago will be possible.

Sulphur is used mostly in making sulphuric acid, an important reagent in the fertilizer, paper, and steel making industries. There is a present con-

nption of this commodity of over 200,000 tons year in the Chicago District and in the territory mediately tributary to it. Sulphur can be handled chanically and lends itself to shipment by barge.

Silica Sand. Silica sand is produced in large antities along the Illinois River in the general inity of Ottawa, Illinois. It is generally refined the pits and shipped by rail largely to points in east, where it is used for molding purposes, glass king, and abrasives. Five producers shipped approximately 16,000 cars in 1926, or 800,000 tons, of ined sand, going to Cleveland, Detroit, Toledo, ndusky, Buffalo, Niagara Falls, and points in nada.

There have been a few experimental shipments water of crude silica sand but none of the refined nd for which there is the larger market. With e completion of the Lakes-to-the-Gulf Waterway this material may move by barges to Chicago where it could be transferred directly to ships.

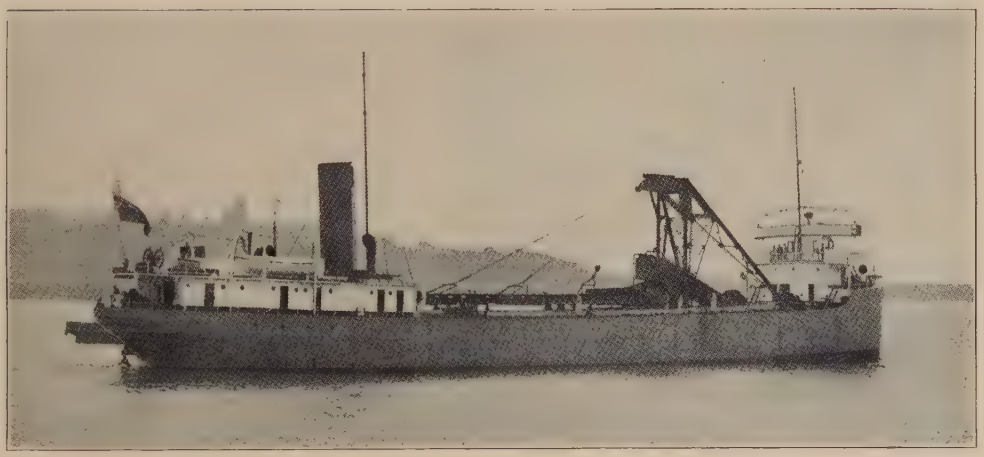
Shipbuilding and Repair. The Chicago Region has not been of much importance in recent years as a center of shipbuilding and repair. In spite of a comparatively favorable situation as to supplies and costs of materials the labor market has generally been such as to prevent any extensive development in this direction. The few dry docks on the Calumet River seem to be ample in capacity to care for present requirements for the repair of ships.

It may be that the demand for river barges, which should follow the opening of the Illinois Waterway, will result in the establishment of boat yards capable of producing this class of vessel.

In any event, as the traffic in the ports of Chicago grows, the facilities for repair of vessels should expand accordingly, else the traffic will disappear.

TRAFFIC IN GENERAL CARGO

General cargo includes those classes of goods hich ordinarily do not move in large enough quanies to warrant provision at the terminals of highly specialized equipment; such goods comprise the bulk of the traffic at a commercial port. Among them will be found the following:



Self-Unloading Freighter "Valley Camp"

Receipts		*Shipments*	
Raw sugar	Vegetables	Leather goods	Machinery
Bananas	Miscellaneous foods	Dressed meats	Trucks
Other fruits	Precious woods	Lard	Pipe
Coffee	Manila	Hides	Hardware
Tea	Tobacco	Flour and millstuffs	Agricultural implements
Dyewoods	Cotton goods	Confectionery	Engines
Rubber	Bagging	Miscellaneous foods	Automobiles
Rubber goods	Machinery	Dry goods	Pianos
Burlap	Automobiles	Rope	Wool
Cork	Chemicals	Furniture	Bags and Bagging
Sisal and hemp	Glassware	Wax	Binder twine
Fish	Cotton	Copper products	Railway cars and parts
Cocoa	Unclassified	Iron and steel products	Unclassified

Lake Going Barge—New York to Duluth Route

This class of water traffic might be separated into groups: the first group including articles for or consumption exclusively by individuals, such clothing and foodstuffs; the second comprising materials for manufacture of articles not included in the first class, and also the products of manufacture.

A measure of volume of the first group for a given area is the population; a measure of the second group is value of manufactures.

During the past forty-five years the bulk of the foreign and domestic commerce of the United States has been carried on through the five so-called North Atlantic ports of Boston, New York, Philadelphia, Baltimore and Norfolk. So far as the population and value of manufactures in the area tributary to the North Atlantic ports have contributed to the general cargo movement through those ports, at least so far will the population and value of manufactures in the area tributary to the Great Lakes ports measure their potential traffic in goods of like character.

FOREIGN TRADE

Comparison of Traffic Possibilities—Foreign Trade

	Year	North Atlantic Ports	Great Lakes Ports
Population of tributary area	1910	63,400,000	38,500,000
	1920	72,750,000	43,200,000
	1955 (est.)	—	62,600,000
	1970 (est.)	—	72,500,000
Area of hinterland—square miles		1,200,000	1,150,000
Value of manufactures of hinterland	1910	$17,800,000,000	$ 9,000,000,000
	1920	52,700,000,000	28,900,000,000
	1955 (est.)	—	50,100,000,000
	1970 (est.)	—	62,750,000,000
Foreign trade in General Cargo—Tons	1920 (actual)	19,000,000	—
	1955 (potential)	—	18,000,000
	1970 (potential)	—	22,800,000

Foreign traffic in general cargo will be handled largely at the ports of Duluth-Superior, Milwaukee, Chicago, Detroit, Toledo, Cleveland, and Buffalo. Nearly half of the population of these port cities and their suburbs is to be found in the Chicago metropolitan district. The area strictly tributary to Chicago has about half of the population of the area tributary to all these ports; it has one-fourth of the manufactures, and its mean land haul to port is some 40 per cent greater. Considering these factors, and bearing in mind that a large local population is the most potent one of all in attracting trade, it is not unwise to assume that about 40 per cent of this traffic will center in this Region.

New York State Barge Canal Terminal—Rochester

DOMESTIC COASTWISE TRADE

Comparison of Traffic Possibilities—Domestic Coastwise Trade.

	Year	North Atlantic Ports	Great Lakes Ports
Population of tributary area	1910	72,766.000	51,934,000
	1920	84,713,000	60,630,000
	1940 (estimated)	—	77,000,000
	1960 (estimated)	—	94,500,000
Area of hinterland—square miles		1,500,000	1,100,000
Value of manufactures of hinterland	1910	$18,500,000,000	$14,100,000,000
	1920	56,400,000,000	43,500,000,000
	1940 (estimated)	—	55,000,000,000
	1960 (estimated)	—	78,500,000,000
Coastwise trade in General Cargo—Tons	1920 (actual)	6,877,100	5,750,000
	1940 (potential)	—	6,765,000
	1960 (potential)	—	9,640,000

As far as Chicago alone is concerned perhaps 25 per cent of this potential traffic may be expected to pass through its port. It has nearly 50 per cent of the lake front city population; its hinterland has 37 per cent of the population of the entire area tributary to the Great Lakes ports and about 31 per cent of the value of manufactures.

The mean land haul to Chicago is 283.5 miles as compared to 174 miles to the other lake ports. With coastwise traffic this is probably much more of a factor than with foreign trade, for with the former alternate land transportation is available and will be used in cases where the land haul to water is comparatively great.

INLAND WATERWAY TRAFFIC

Comparison of Traffic Possibilities—Inland Waterway Traffic

	Year	North Atlantic Ports	Chicago
Population of hinterland	1900	11,370,000	18,820,000
	1910	15,642,000	21,719,000
	1920	18,518,000	24,653,000
	1940 (estimated)	—	31,000,000
	1960 (estimated)	—	36,500,000
Value of manufactures of hinterland	1900	$ 4,428,000,000	$ 3,000,000,000
	1920	17,364,000,000	14,500,000,000
	1940 (estimated)	—	19,400,000,000
	1960 (estimated)	—	27,700,000,000
General cargo traffic—short tons	1920 (actual)	3,700,000	—
	1940 (estimated)	—	5,400,000
	1960 (estimated)	—	6,600,000

Courtesy Standard Oil Co.

Lake Oil Tanker

ne of the foregoing estimates take into con- tion physical conditions which might affect the of traffic. Among these considerations are: ation density, railroad density, average length d haul to port, length of navigation season, verage fog conditions.

the case of foreign and domestic trade the ined effect of these factors is believed to be ible. Population density and railroad density e equivalent for the years compared; while ge distance to port favors the Great Lakes so much as to offset disadvantages of a shorter ation season and more severe fog conditions.

th inland waterway traffic, however, popula- lensity and railroad density are so much in of the area tributary to the North Atlantic as to warrant the reduction of the estimates tential traffic for Chicago by 66 per cent.

seems reasonable, therefore, that between now he years 1960 to 1970 there will have been a ient increase in the population and productivity of the areas tributary to Chicago to warrant the following estimates for potential traffic in general cargo.

ANNUAL COMBINED TRAFFIC

Foreign Trade	7,850,000 tons
Coastwise Trade	2,450,000 tons
Inland Waterway Trade	2,200,000 tons
Total	12,500,000 tons

Considering foreign traffic in general cargo, receipts at the North Atlantic ports in 1920 were approximately 70 per cent of the shipments. The same ratio is likely to apply to the potential foreign traffic at Chicago for the trade characteristics of the tributary areas involved are quite similar for the times between which comparison is made.

With potential coastwise traffic the situations as to tributary areas are not sufficiently comparable to make a parallel assumption with much accuracy. The same is true with regard to inland waterway traffic.

SUMMARY OF FUTURE TRAFFIC POSSIBILITIES

ese investigations of existing and potential borne commerce in the Chicago Region are to insure that the plans for modification of ng harbor facilities and for location, layout. lesign of future works of this character will ample provision, in the major features, for all classes of water traffic of notable consequence.

There may be too much optimism expressed as to growth in water traffic in general; however, the object of these predictions is not to further the interests of waterway improvement, but only to insure adequate capacity in the structures proposed.

FUTURE TRAFFIC PROBABILITIES—CHICAGO REGION.
(1,000's of tons per year.)

	Lake			Barge Waterway		
	Receipts	Shipments	Total	Receipts	Shipments	Total
al Cargo	4,120	6.180	10,300	1,100	1,100	2,200
trial and Bulk Interchange Cargo—						
umber, and wood products	0	0	0	1,000	0	1,000
rain	0	4,500	4,500	0	500	500
re, Iron	30.000	0	30,000	0	1,500	1,500
nthracite	250	0	250	0	0	0
oal, Bituminous	9,000	1,500	10,500	3,500	0	3,500
and, Gravel and Crushed Stone	1.500	0	1.500	1,750	0	1,750
luxing Stone	7,500	0	7,500	0	0	0
etroleum, and Petroleum Products	0	2,000	2,000	100	0	100
ron and Steel Products	0	500	500	0	500	500
liscellaneous	3 150	850	4,000	650	350	1,000

affic shown in the foregoing table should be enough and in proper ratio to meet this gen- requirement as regards capacity. It is believed that the traffic estimated is of sufficient volume to cover growth for the next 30 to 50 years; estimates for a longer period are of little value.

X.

PROPOSED TERMINAL FACILITIES

GENERAL REQUIREMENTS

THE harbor facilities required locally may be grouped into two general categories that affect rs of location and general layout; these are ercial terminals, and industrial and bulk inter- e terminals. Commercial terminals are neces- for the handling of miscellaneous package t which now moves by lake and is expected to by barge waterway, and via the St. Lawrence rway as well. Industrial and bulk interchange nals will be required for the heavy raw ma- of industry and other bulky commodities. A rehensive water terminal plan for the Chicago n must make adequate provision for each of types of development.

ving in mind the source and destination of the traffic that may result from the several im- ments heretofore discussed, any general he of harbor development for the Chicago n should also provide plans for terminals for andling of water-borne freight as follows:

(a) Local lake freight (i. e., freight originating from or destined to points in the Chicago Region).

(b) Interchange lake freight (i. e., that originating from or destined to the hinterland).

(c) Local barge freight.

(d) Interchange barge freight.

e interchange facilities will require arrange- s for transfer between water carriers as well tween water and land carriers.

The general plans for these terminals should be worked out in such a way that facilities may be added promptly, economically, and indefinitely, so that all reasonable future demands of water-borne traffic in the way of terminal facilities may be met.

The plans should also relieve any present demand for increased and improved facilities, and the program for present relief should be co-ordinate with the general plans for future expansion.

Consideration should be given to local problems such as street traffic and lake front improvement, to zoning ordinances, and to present use of property.

The need to plan for indefinite expansion calls for the selection of sites and the arrangement of facilities in such a way that a very extensive development may take place in the future with space remaining for the addition of more units of all kinds. The best way of insuring the fulfillment of this condition is to locate and design the facilities upon assumptions of volume of commerce to be handled which are sufficiently broad to include all reasonable growth for many years to come, at the same time arranging the layout so that other units may be added should they ever be desired.

This purpose is served by taking the tonnages given in the table "Traffic Probabilities in the Chicago Region" in the preceding chapter as representing safe assumptions as to volume of future water-borne commerce.

COMMERCIAL LAKE HARBORS

SPECIFIC REQUIREMENTS

nsidering the package freight business by lake and using specifications as to sizes of slips, rage basins, and channels, also as to capacity of piers, railroad connections, unloading devices and the like which appear to apply to local conditions, the commercial harbor or harbors of the future should have the following general features and still be capable of further expansion:

Anchorage area, acres	1,287
Slip and channel area, acres	430
Total water area, acres	1,717
Commercial piers, acres	100
Yards and approaches, acres	233
Total area—acres, water, and land	2,050
Total berthing space—feet	34,333
Transit shed floor area—square feet	4,580,000
Transit and storage shed—square feet	13,730,000

To reduce pickup and delivery by truck to a minimum, a fairly centralized location is desired for the commercial lake terminals. Over 75% of the population of the region lives within fifteen miles of the center of the city of Chicago. Increasing the radius to twenty miles takes in only a few more people, decreasing it to ten miles excludes a large population, so the location should be within the zone established by the fifteen mile radius.

A connection to the Illinois Waterway is essential, either directly by canal or river, or by means of a protected passage along the lake front to a connecting canal or river.

The requirement that indefinite expansion should be possible limits the location to the lake front, for while some interior location such as Lake Calumet might provide for practically unrestricted increase in dock facilities, a definite upper limit is fixed by the capacity of the connecting channel to pass the ships between the harbor and Lake Michigan.

Direct and adequate connection to two or more railroads or a belt line should be available.

Consideration of these factors limits the selection of a site for the commercial lake terminal to the following general locations:

1. Lake front between Oak Street and 41st Street.
2. Lake front between 86th Street and a mile east of the old entrance to Wolf Lake.

Between Oak Street and 41st Street, there are approximately six miles of lake front of which about three are reserved for park purposes—i. e., between Randolph and 16th Streets and between 31st and 41st Streets—but there is no physical reason why the water area off these park lands could not be available for anchorage purposes. This intervening stretch of water, which should be kept open, necessitates a complete harbor development at either end, if a centralized commercial terminal is to be provided.

If the terminals are so arranged that use may be made of this intervening stretch of open water for anchorage purposes it is not necessary to provide additional anchorage space within either development as the requisite open water area will be found between Randolph Street and 16th Street.

TERMINALS BETWEEN OAK STREET AND RANDOLPH STREET

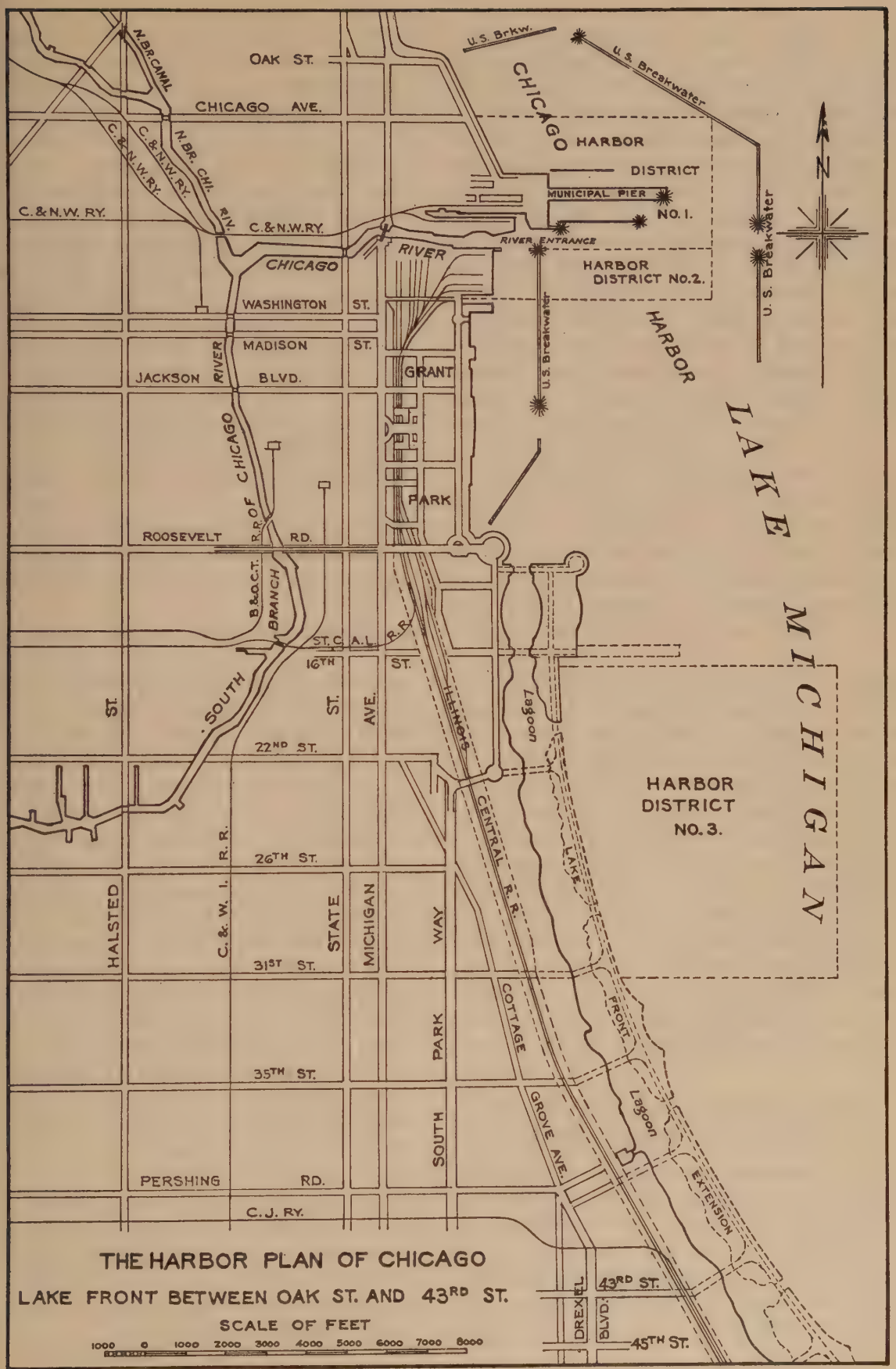
Between Oak Street and Randolph Street are the lake portions of Harbor Districts Nos. 1 and 2. The United States Government has built two breakwater systems, one about 1800 feet to the east of Grant Park, enclosing a water area of about 225 acres largely used as a yacht harbor at present; the other a mile to the east, extending to the north and west to the shore near Oak Street. This exterior breakwater shelters the entrance to the Chicago River and protects the boats at the outer piers.

Railroad Connections. Two railroads reach the lake front near the mouth of the Chicago River. On the north side the Chicago & Northwestern Railway serves terminals on both sides of Ogden Slip, but does not reach the Municipal Pier. While most of the line is double tracked part of it is not. Its present unused capacity is estimated to be about 200 cars per day in each direction. If double tracked throughout, the line might have an approximate unused capacity of 500 cars per day each way. The Chicago & Northwestern Railway makes no direct interchange of cars with other trunk lines, intermediate switching being necessary in each case.

On the south side of the mouth of the Chicago River, the Illinois Central Railroad together with its tenant roads, the Michigan Central and the Chesapeake and Ohio, has a large freight terminal development. The main lines determine the capacity of future freight installations; they are now in use for passenger and freight service. It has been estimated that about 600 cars a day in each direction may be added without overcrowding the main lines. It will not be practicable to enlarge the capacity by the construction of one or more tracks through Grant Park. The Illinois Central Railroad makes direct connections with all principal trunk lines.

To handle the daily car movements which the future traffic of a centralized port development will necessitate, and to provide facilities for expansion, it is apparent that recourse must be had to additional rail connections. Possible solutions are:

1. By tunnel west from the Municipal Pier under Grand Avenue; under the North Branch of



THE HARBOR PLAN OF CHICAGO

LAKE FRONT BETWEEN OAK ST. AND 43RD ST.

SCALE OF FEET

1000 0 1000 2000 3000 4000 5000 6000 7000 8000

cago River, paralleling the Chicago & North- Railway to rise to grade and thence to ele- between Western Avenue and Sacramento , thence west to the Belt Railway of Chi- Cicero Avenue.

By tunnel under Grant Park to the Illinois Railroad right of way at about 13th to 16th thence west on the proposed 18th Street air the Chicago and Western Indiana Railroad, south to the Belt Railway of Chicago.

By tunnel under Grant Park to the Illinois l Railroad right of way at about 13th to 16th thence south to 31st Street paralleling the Central, thence west to the Chicago and n Indiana Railroad as before.

By tunnel under Grant Park to a right of way ling the Illinois Central from 26th Street o connect with the Chicago Junction Railway Place.

road yards should be provided at the terminal permit the following operations:

sification of inbound cars as to pier destina-

sification of outbound cars as to line destina-

first is absolutely essential as this operation be conducted any distance from the piers. econd, while not essential, is desirable, as an nal yarding is avoided in the interior if line ications can be made on the lake front.

LROAD YARDS. Investigation shows that there veral solutions of the railroad yard problem in r District 1 and 2. All require the use of re- d land on a large scale, however. The dis- between the northern and southern boundaries harbor areas is rather scant, as is also the ble space landward of the Municipal Pier. ver, by putting all trucking on elevated streets ll dimensions may be utilized for yards and aches. Approximately 20 acres of land are re- l for every 1,000,000 tons of cargo (both in utbound); for the traffic for which the harbor ng designed a little over 200 acres will be re- l. Electrification of all rail service would be ved.

REET TRAFFIC. If the harbor is to handle the c for which designed, the maximum daily ment of trucks to and from the commercial r would amount to about 4500 in each direc- Street connections capable of absorbing a two movement of at least 9000 vehicular move-ments per day must be made available, for the dumping of that additional volume of traffic in the downtown section of Chicago without compensating for it in any way would be extremely shortsighted. The plan should include means of by-passing the congested district in such a way that projects for relief from other traffic ills will not be interfered with in the least. The only reasonable solution that appears to answer this requirement is the continuation of the double decked street development from Michigan Boulevard to the lake, and along the river as far south as Roosevelt Road. Then the heavy truck movement could encircle the loop; loop destinations could be reached with a minimum of traveling in the loop, and external points could be reached without interfering with loop traffic except at the bridges over the river.

Obviously the port development should not have to bear all of the cost of this improvement, for the upper level would be used for automobile traffic, and part of the lower level would be used for trucking for other purposes. But since a large downtown port development may create the necessity it would be logical to make it bear a good share of the expense.

BARGE WATERWAY CONNECTIONS. The Chicago River and the Chicago Drainage Canal form the links between any harbor development near the mouth of the Chicago River and the Lakes-to-the-Gulf Waterway. This connection is so obstructed by bridges affording limited vertical clearance that the passage of any number of unloaded package freight barges is out of the question. Lateral clearances, while also limited, are believed to be adequate for the comparatively light barge-to-ship interchange traffic that is expected to materialize. Since increasing the vertical clearance of the bridges over the Chicago River is out of the question for many years at least it probably will be necessary to handle a portion of the ship-to-barge interchange traffic by lighters.

TERMINALS BETWEEN 16TH STREET AND 41ST STREET

The park development which extends from Grant Park to Jackson Park includes the entire lake front between 16th and 41st Streets, though lakeward of the proposed park and between 16th and 31st Streets lies Harbor District Number 3. There are no harbor works of any sort in this area, but the government breakwater opposite the mouth of the

Chicago River now reaches as far south as Adams Street extended, and its prolongation in a southerly direction to afford the necessary general protection to any facilities to be provided would not be difficult.

Railroad Connections. The so-called Lake Front Ordinance of July 21, 1918, which established Harbor District Number 3 provided for four direct connections to the lines of the Illinois Central Railroad at points to be selected between 16th and 31st Streets, each connection to be of two tracks. No exact locations were specified. This ordinance also provides for connections to railroads west of the right of way of the Illinois Central Railroad, one via the proposed 18th Street connection, the other between 18th and 31st Streets at a point to be selected when required.

While it would be comparatively simple to make a direct connection with the lines of the Illinois Central from any part of a harbor development in Harbor District Number 3, the only way to make such a connection and not mar the beauty of the parks would be by tunnel. The four different connections authorized in the ordinance probably could be made in this fashion as far as physical difficulties are concerned, but as there is no foreseeable necessity for more than a single two track connection, only one need be considered.

Likewise there are serious objections to a railroad viaduct over the parks to the 18th Street air line or to any other cross town air line connection north of 31st Street. To reach the 18th Street Viaduct by tunnel from the harbor area, the tunnel must cross under the park near 31st Street, curving north to parallel the east right of way line of the Illinois Central Railroad and the track must then rise on excessive grades to cross the Illinois Central Railroad near 18th Street.

A 31st Street cross town viaduct with the track curving north after crossing over the Illinois Central Railroad, and then dropping to cross under the park in a tunnel at 16th Street, would introduce the same difficulties.

To conform with the general principle that rail connections be made to at least two railroads which make direct interchange with most of the other railroads in the Chicago Switching District, contact with the Chicago Junction Railway at 41st Street is advisable. This crosses the Illinois Central on a viaduct which comes to grade at about 44th Place.

The best solution appears to be to run a two track tunnel southward under the park and lagoons, the southern portal being located east of the Illinois Central tracks south of 39th Street and the railroad coming to the grade of the switchback of the Chicago Junction Railway. This would provide a direct connection to both the Illinois Central Railroad and the Chicago Junction Railway and avoid all obstruction of the park.

Street Connections. The Lake Front Ordinance provides for harbor approaches by street as follows:

1. "An Eighteenth Street Subway" extending from the end of East Eighteenth Street at right angles under the right of way of the Illinois Central Railroad.

2. "A Twenty-second Street Harbor Viaduct" extending across the lands of the railroad and conforming in design and appearance to the viaduct already constructed for automobile traffic.

3. "A Thirty-first Street Harbor Viaduct" extending from the westerly line of the right of way of the railroad immediately north of and contiguous to the park viaduct now under construction.

It is believed that two of the three street connections to the interior of the city would be sufficient for an almost indefinite period. There is a large north and south traffic to be intersected but with two outlets there is ample opportunity for dispersion and an addition of 9000 or more vehicle movements daily could be absorbed readily. Additional crossings of the park and Illinois Central Railroad would be practicable at any future time, but their necessity is not apparent now.

Barge Waterway Connections. There seems to be but one practical solution to the problem of providing a suitable connection to the main Drainage Canal and the Illinois Waterway. This is a route by way of a protected channel along the lake front between Harbor District Number 3 and the mouth of the Chicago River. While the main harbor breakwater would protect ships and lakegoing tugs and barges, it would not be close enough to shore to afford sufficient protection to river craft of comparatively frail construction. An auxiliary breakwater is therefore required extending from the gap in the old government breakwater east of Grant Park to a safe entrance into Harbor District Number 3.

Calumet Interstate Harbor

ERMINALS BETWEEN 86TH STREET AND A MILE EAST OF THE OLD ENTRANCE TO WOLF LAKE

his section there are approximately four miles ter front of which the two to the north are ied by two steel companies and Calumet Park. 1500 feet of frontage immediately south of net Park is unoccupied at present; then comes feet now being improved by the State Line rating Company for a power plant site; then feet of unused frontage which is privately d and extends to the piers which mark the er entrance to Wolf Lake. South of these there is a park owned by the city of Ham-

umet Harbor occupies the first two miles of front on the north; a government breakwater ecting the entrance to the Calumet River also ds an anchorage basin of about 400 acres. e main line railroads and one belt railroad par- the lake shore a short distance back so that all or lands will have to be reclaimed from Lake igan except where it is possible to cross these bads and make use of the unoccupied areas in icinity of Wolf Lake.

e commercial harbor development should be as o the north in this section of the lake front as possible to locate it; first, because it will be er the center of the metropolitan area and aver- trucking distances will be reduced; second, be- e it will be nearer the Calumet River and barge lighterage traffic will be facilitated; and third, use industrial harbor development may ulti- ly require most, if not all, of the rest of the able lake front as far as Indiana Harbor.

AILROAD YARDS AND CONNECTIONS. There are ral large tracts of land in the vicinity of Wolf e which are suitable for use as railroad yards hat it will be unnecessary to reclaim the bed of e Michigan for this purpose. These lands may ad for so much less than it costs to reclaim the of Lake Michigan that in spite of the disadvan- of having the major yard development some ance from the harbor it is believed wise to take ntage of this situation. In either event it is ssary to have a railroad line along the lake front ch cuts across the main lines of railroad previ- y referred to, as it is desirable to make contact only with the Elgin, Joliet & Eastern Railway, the easternmost of the marginal lines, but also with the Indiana Harbor Belt Railroad and others which are in the interior.

The harbor railroad yards near Wolf Lake therefore would be connected with the pier tracks either by way of the tracks of the Elgin, Joliet & Eastern Railway, on a wheelage basis, or over an independent right of way. In the first instance the crossing of the main lines might be by subway near the entrance to Wolf Lake. In the second an elevated line probably would be required, either over the right of way of the Elgin, Joliet & Eastern Railway or over the edge of the property of the State Line Generating Company, as space may not be available for a line on grade. In this latter case the crossing of the main lines would be over a viaduct.

From the harbor yard direct contact may be made with the Indiana Harbor Belt Railroad and with the Elgin, Joliet & Eastern Railway. Direct connections could also be made at comparatively small expense with several other roads, such as the Chicago & Western Indiana, the New York Chicago and St. Louis, the South Chicago and Southern and the Calumet Western.

STREET CONNECTIONS. Street connections will be expensive to provide on account of the intervening main lines of railroad. At 100th Street there is now a subway under all but the Elgin, Joliet & Eastern Railway, and investigation shows that it is practicable to raise this line sufficiently to permit a grade separation not only at 100th Street, but also at 99th and perhaps even at 98th Street. One Hundred Second Street is as far to the southeast as a subway may be constructed without encountering serious difficulties with the railroad yards and switch tracks.

A right of way for a street along the edge of Calumet Park will be necessary to connect the harbor area with the existing subway at 100th Street and the others that may be built later at 99th and 98th Streets.

BARGE WATERWAY CONNECTIONS. The Calumet River, the little Calumet River and the Calumet-Sag Channel would form the connection between a commercial harbor at this location and the main Drainage Canal and Illinois Waterway. With the commercial barge terminal on the Chicago River or main Drainage Canal, ship-to-barge interchange would be handled largely by lighters, for the interior connecting waterway is circuitous and includes

the Sag Channel which is narrow and obstructed by fixed bridges, while the exterior route utilizes the open lake which is hazardous for ordinary barge traffic.

The proximity of this development to the large electric power station of the State Line Generating Company, representing an investment of $100,000,000 for the service of Chicago industries, necessitates the taking of such measures as will insure that a free circulation of large quantities of condensing water is not interfered with. Culverts or tunnels under the harbor works may have to be provided for this purpose.

RESUMÉ

The foregoing investigations lead to the conclusion that centralization of commercial lake terminal facilities is impracticable, particularly when the disadvantages of each alternate scheme are considered. These are set forth briefly below:

Municipal Pier Area

Limited extent of lake front.
Congested condition of nearby streets.
Restricted space for railroad yards.
High cost of adequate rail connections.
Obstructions to barges along channel to barge terminal necessitating lighterage.

Harbor District Number Three

Interference with park program.
High cost of adequate rail connections.
Obstructions to barges along channel to barge terminal plus added cost of auxiliary protection on lake front for safe passage of barges to mouth of river.

Near Mouth of Calumet River

Remoteness of location with respect to those shippers and consignees served by truck.
Necessity of lightering some barge-to-ship transfers from barge terminal to ship harbor, or
Ultimate widening of Calumet-Sag Channel and raising of bridges to provide headroom of at least 21 feet.

Most of the disadvantages applying to the first two plans cannot be overcome except at what might be prohibitive costs. A few could not be overcome at all.

Since the alterations to the Sag Channel are involved in the best solution of the problem of providing adequate industrial and bulk interchange terminal facilities (to be discussed later), the cost is not entirely chargeable to the commercial terminal project. Therefore, this disadvantage to the third lake front location (i. e., near the mouth of the Calumet River) may be overcome at a reasonable cost.

The first disadvantage to the third location, i. e., its remoteness with respect to local users, may be partially overcome by making sufficient provision in the way of terminal facilities at the Municipal Pier area for the service of passenger vessels and express cargo liners, and locating the rest of the commercial lake terminals near the mouth of the Calumet River. There is ample space near the Municipal Pier for the passenger and express cargo facilities, and rail and street connections may be provided. No disadvantage would accrue to the vessels from such a separation of facilities, as there is a distinction among them which conforms closely to this arrangement.

The second disadvantage to the third location is common to all.

RECOMMENDED SOLUTION

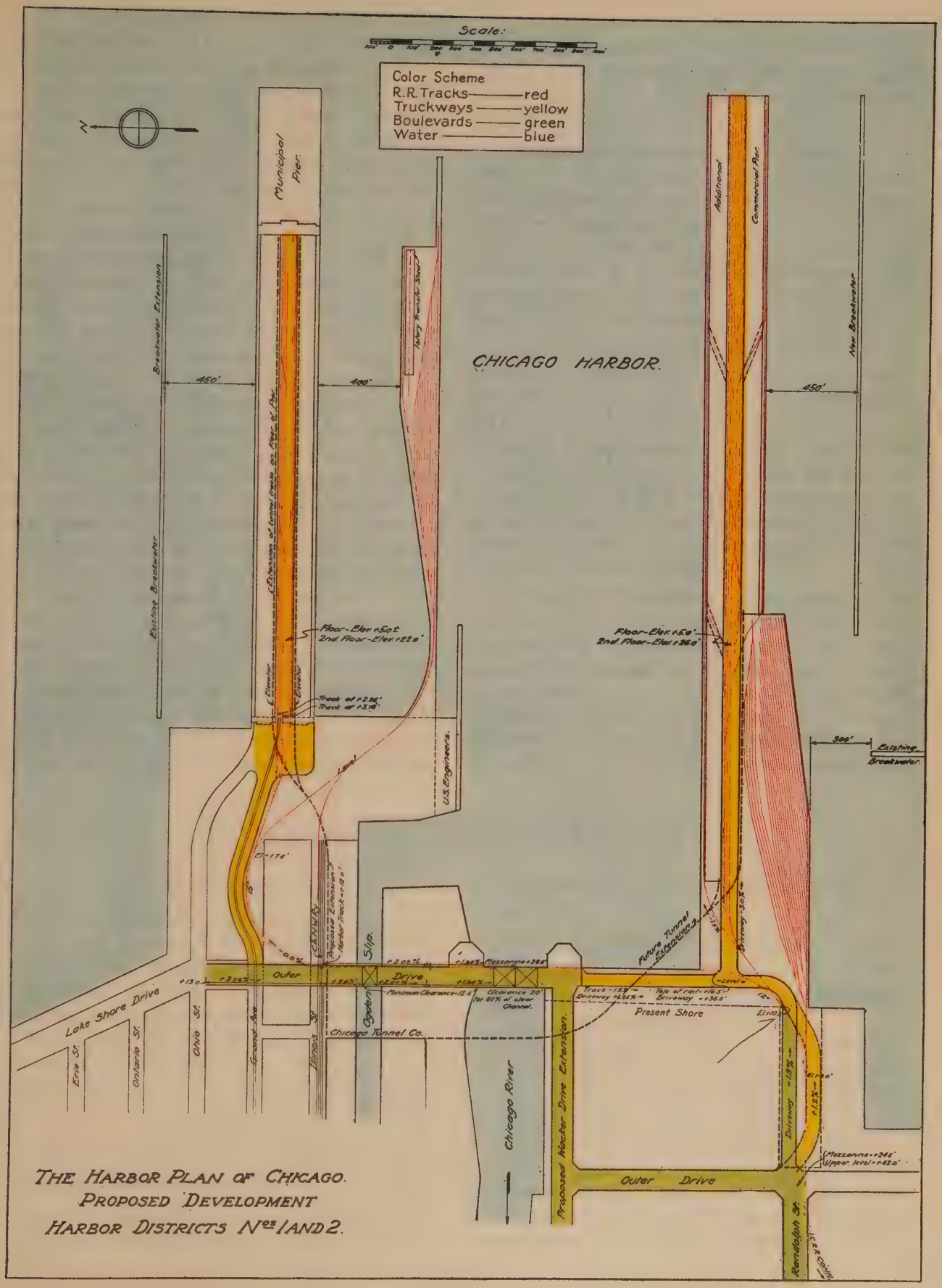
The arrangement of the major commercial lake terminal developments for the Chicago Region which seems to combine the greatest number of advantages with the least serious disadvantages is:

For lake passenger vessels and express cargo liners; near the mouth of the Chicago River.

For general commercial traffic; at the interstate harbor southeast of the mouth of the Calumet River.

To conform with this ultimate solution the general arrangement of commercial harbor facilities in Chicago Harbor includes the construction of an additional pier parallel to the Municipal Pier and immediately to the north of Randolph Street extended including the necessary railroad yards and connections for the service of both piers by both the Illinois Central Railroad and the Chicago and Northwestern Railroad. This development may be made at a reasonable cost and the land traffic resulting, both rail and street, will not tax the capacity of existing approaches.

This arrangement does not afford ideal railroad service, for it provides direct connection to only two of the main lines entering the city and does not give belt line service. However, the two connecting lines interchange with all of the others, so that the only disadvantage that exists, as compared with a belt line connection, is one of possible inferior service which sometimes results when a main


Scale:
Color Scheme
R.R. Tracks——red
Truckways——yellow
Boulevards——green
Water——blue
N
Municipal Pier
Breakwater Extension
Existing Breakwater
CHICAGO HARBOR.
Additional Commercial Pier
New Breakwater
450'
400'
450'
300'
Existing Breakwater
Floor-Elev.+15.0'
2nd. Floor-Elev.+22.0'
Floor-Elev.+15.0'
2nd. Floor-Elev.+28.0'
Track at +2.25'
Track at +3.18'
Level
U.S. Engineers.
El.-17.6'
CANAL St.
Slip
Future Tunnel Extension
Driveway +30.5'
Outer Drive
Minimum Clearance-12.6'
Clearance 20' for 80% of clear Channel.
Mezzanine+28.6'
Level
Lake Shore Drive
Erie St.
Ontario St.
Ohio St.
Grand Ave.
Illinois St.
Ogden
Chicago Tunnel Co.
Present Shore
El.+10.0'
Chicago River
Proposed Wacker Drive Extension
Driveway +15%
Mezzanine+24.5'
Upper level+42.0'
Outer Drive
Randolph St.
THE HARBOR PLAN OF CHICAGO.
PROPOSED DEVELOPMENT
HARBOR DISTRICTS Nos 1 AND 2.

line gives preference to its own traffic in switching.

The route selected for the permanent rail connection between the two piers is by way of a fill paralleling the property of the Illinois Central on the east and leading due north from the prolongation of Randolph Street to the lower level of the proposed Outer Drive bridge, thence north on that level to Illinois Street, thence east to the track system of the Municipal Pier.

On the south side of the Chicago River the approaches to the bridge should be arranged so as to provide a paved passageway for trucks as well as sufficient space for a single line of railroad. The truckway would then be available as a connection with the lower level of the proposed extension of Wacker Drive east of Michigan Boulevard.

A small switching and storage yard is provided on the north side of the river to sort cars for position on the Municipal Pier, and to permit full train movements to be made between the pier and the classification yards of the railroad. This yard can be provided to best advantage about 600 feet south of and parallel with the Municipal Pier. Its southerly retaining wall would be the auxiliary breakwater which now protects the south side of the Municipal Pier. It should have a standing capacity of about 100 cars with provision at its outer end for a locomotive to return around the yard.

In connection with this railroad yard it would be desirable to build a short length of covered transfer platform to facilitate direct transfers between rail and lake carriers. There is room for such a facility at the northeast of the yard where a platform 700 feet in length by 40 feet in width could be provided.

A storage and switching yard is planned on the south side of the Chicago River as well, not only for quick service of the new pier but also to eliminate all unnecessary car movements over the bridge. This yard will be larger than the one on the north side as it is expected that most of the rail-lake interchange traffic will be handled over the Illinois Central Railroad.

All trucking to and from the new pier will take place on a level over the tracks. This will eliminate interference at grades and increase the capacity of the pier.

Should it be necessary for the Outer Drive bridge to be constructed farther east the rail connection across the river could be made to conform to such a location by shifting the entire harbor development on the south side to the east. The costs will not be affected materially.

No details are submitted for the plans for the facilities proposed for handling general commercial lake traffic at the interstate harbor southeast of the mouth of the Calumet River. The general features of this development were discussed on pp. 73 and 74 and the compromise of locating a few of the commercial harbor facilities at the mouth of the Chicago River in no wise affects these general plans.

COMMERCIAL BARGE HARBORS

REQUIREMENTS

In view of the volume of traffic which the commercial barge terminal is likely to have to handle, a fairly large development is going to be necessary in the course of time. The estimated possible future traffic through this terminal is 2,200,000 tons per year. This load will require the provision of facilities as follows:

Requirements of Future Commercial Barge Harbors

Anchorage water area, acres	220
Ship and channel area, acres	55
Total water area, acres	275
Commercial piers or wharves—acres	22
Yards and approaches to commercial terminals—acres	70
Total area, land and water—acres	367
Length of berthing space, feet	8,800
Transit shed floor area—square feet	1,000,000
Transit and storage shed floor area, combined, square feet	3,000,000

The Chicago River is the waterway connection between the Main Drainage Canal and lake front terminals in Harbor Districts Nos. 1, 2 and 3. Due to the numerous obstructive bridges over this connection it would be impracticable to locate the barge terminal on the lake front. To avoid most of the bridges this terminal will have to be west of Loomis Street on the South Branch of the River.

The capacity test applied in this case requires 220 acres of water area for anchorage purposes. In view of the peculiar situation as to interior water routes in the Chicago Region, a basin for breaking up and assembling barge fleets will be required in the vicinity of Joliet. The provision of this basin in adequate size will eliminate the necessity for an extensive anchorage area at the terminal site, so that the requirement of 220 acres could perhaps be reduced to about 100.

LOCATION AND DESCRIPTION

There is no location along the Main Drainage Canal or the Chicago River between Loomis Street and Kedzie Avenue where there is either ample water front or sufficient land and water area available for a terminal development of the requisite proportions. From Kedzie Avenue west on the south bank of the canal is an undeveloped water front several miles in length and from 200 to 340 feet in width, which is public property (Sanitary District of Chicago). A marginal wharf terminal development is practicable here provided the channel is widened to the south to 320 feet. The channel is now a little over 200 feet wide.

The wharf required would extend along the widened section from a short distance east of Crawford Avenue to about a mile west of Cicero Avenue. Additional wharf could be provided by prolonging the widening indefinitely.

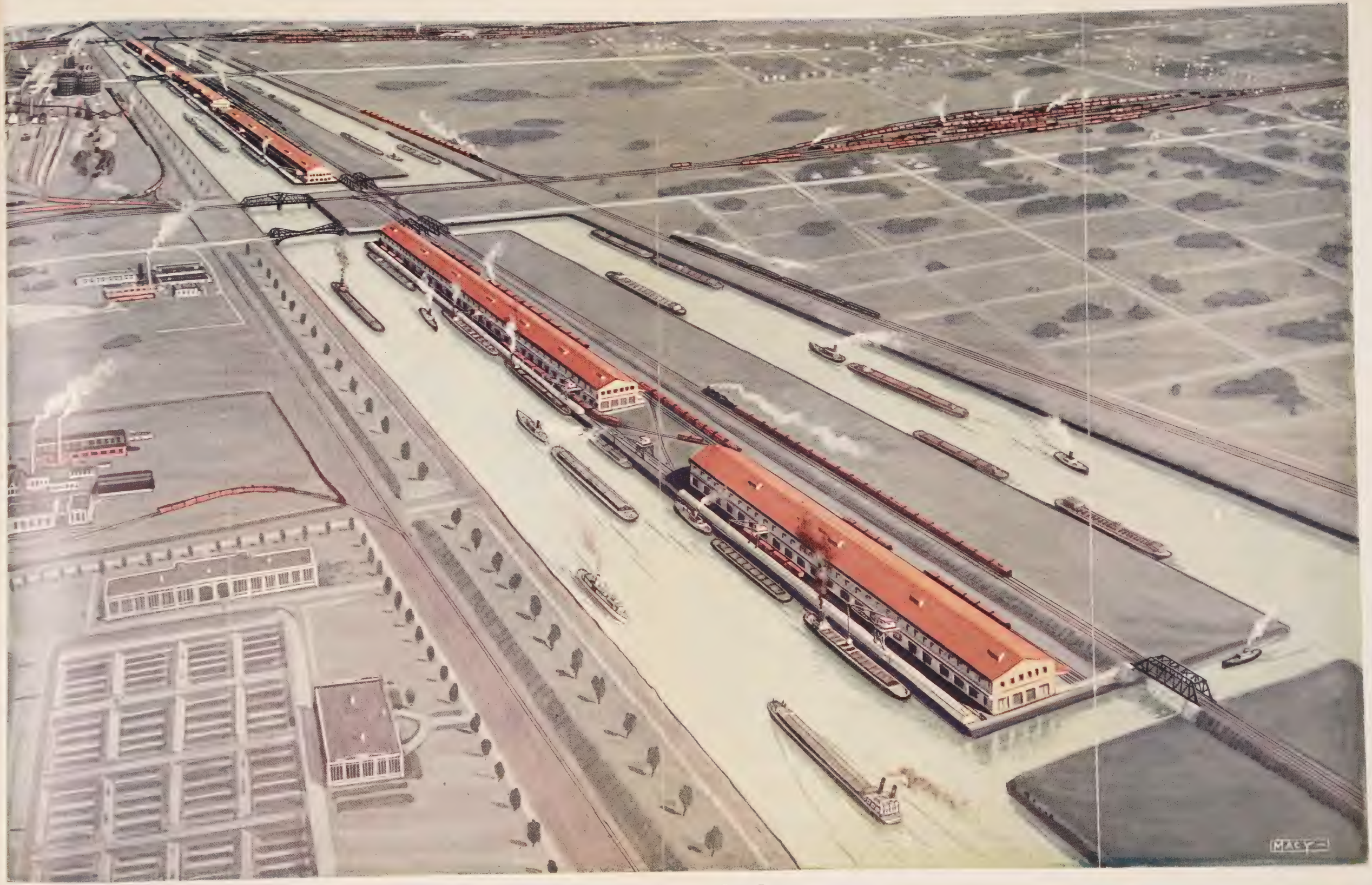
The anchorage basin is not to be obtained in the main channel, but a short distance to the south is the 240 foot right of way of the Illinois and Michigan Canal. The canal was originally 60 feet wide, but years of non-use have resulted in partial filling in. However, the dredging of a portion or all of this right of way to form one or more anchorage basins is a comparatively simple operation. To obtain the full extent, a section about three miles long would have to be improved; however, this would be a gradual development, and all of the estimated area might not have to be provided, and as the Santa Fe Railroad crosses the Drainage Canal a short distance to the west the basin could be widened beyond the point where it crosses. The basin should be connected to the main channel at intervals to permit ready circulation of traffic. It could be narrowed wherever bridges were necessary. All bridges over it and over the connecting passageways should provide 21 feet of headroom.

The marginal strip owned by the Sanitary District of Chicago is wide enough to permit the widening of the main channel and still leave ample space for pier sheds, roadways, and connecting tracks.

Some land would be required in addition to that owned by the Sanitary District for necessary railroad yards. This land is available between Cicero and Crawford Avenues immediately south of the Illinois and Michigan Canal.

Direct rail connection would be possible with the Chicago and Alton Railroad, and Atchison, Topeka and Santa Fe Railway but as these parallel the Illinois Waterway for some distance there would be little traffic to be interchanged with them.

Traffic on New York Barge Canal



Crawford Avenue Commercial Barge Terminal

Direct rail connection is also practicable with the Illinois Northern Railway, and also with the Belt Railway of Chicago east of Cicero Avenue. This latter connection is most important and one that should be made in preference to all others. By carrying the harbor railway along the Drainage Canal to the northeast, contact might be made also with the Baltimore and Ohio Chicago Terminal Railroad, the Pennsylvania Railroad, and the Chicago Junction Railway.

To provide ample clearance under all bridges over the anchorage basin and its approaches, it will be necessary to raise the main line of the Santa Fe Railway a few feet. However, the raising of this railroad is involved in the extension of Cicero Avenue over the Chicago Drainage Canal so that the additional elevation required to provide sufficient headroom is slight and not impractical to obtain at reasonable cost.

A portion of the commercial barge terminal business may ultimately be taken care of at Joliet where the river fleets are to be broken up or assembled. Package freight in barge-lot shipments destined to or coming from points beyond Chicago, may be interchanged there, between barge and rail, by bringing the Elgin, Joliet and Eastern Railway to an appropriately located transfer house on the water front. Since many years will elapse before there will be enough of this transfer business to justify the construction of a special terminal, no action seems necessary at present with respect to it.

The demand for commercial barge terminal facilities in the Calumet Region may be sufficient at some future date to justify their provision. The logical location for this class of terminal would be in Lake Calumet. As ample space is available there for many years to come, no special steps in this direction appear to be necessary at present.

The general conclusions with regard to the location of commercial barge terminals are therefore as follows:

For commercial barge traffic: On the Drainage Canal near Crawford Avenue; and in Lake Calumet (ultimately).

For rail interchange barge traffic (ultimate): Lake Joliet.

FEDERAL BARGE LINE TOWBOAT "NATCHEZ"

INDUSTRIAL AND BULK INTERCHANGE HARBORS

An industrial harbor is a facility which provides access for water carriers to the immediate proximity of large industries where bulky commodities usually are received or shipped in full cargo lots. Industrial harbor facilities are to navigation as industrial sidings are to railroads.

A bulk interchange harbor is an arrangement for the transfer of bulk commodities between rail and water carriers.

The types of vessels that serve these two kinds of traffic are the same, as are also the kinds of cargo handling devices. The type of industry that is interested in harbor facilities is usually of a kind not desired in proximity to commercial and residential occupation; bulk interchange facilities operate to better advantage at locations free from congestion. Both types of harbor facility have enough in common, therefore, to make it desirable to consider them together in a study of this kind.

REQUIREMENTS

If the industrial and bulk interchange harbors in the Chicago Region are to handle the traffic estimated for the future the following requirements must be fulfilled:

Resumé of Industrial and Bulk Interchange Terminal Requirements.

Commodity or Industry	Total Requirements	Now in use or Reserve	To Be Supplied	General Location
Grain	Elevator storage capacity of: 43,750,000 bushels	36,050,000 bushels capacity	7,000 feet frontage— 50 acres land—14,900,000 bushels storage of which 7,200,000 bushels capacity is to replace elevators on Chicago River	Calumet District
Lumber	5,000 feet waterfront 50 acres land	25,000 feet waterfront 150 acres land	0 0	Now available on Chicago River
Steel	30,000 feet waterfront 3,000 acres land	25,800 feet waterfront 2,620 acres of land	4,200 feet waterfront 380 acres land	Calumet District
Bituminous Coal	29,070 feet waterfront 266 acres land	Indefinite—but known to be ample except for interchange business	For interchange between rail and lake only: 3,000 feet waterfront 50 acres land	Half at Michigan City Half in Calumet District
Anthracite	714 feet waterfront 8.3 acres land	Indefinite—but ample capacity at one terminal in South Chicago of 1,572 feet of waterfront —12 acres of land for storage	0	Calumet River
Sand, Gravel and Crushed Stone	13,750 feet waterfront 100 acres land	6,600 feet waterfront 40 acres land	7,150 feet waterfront 60 acres land	Chicago River 4,000 feet and 35 acres Calumet River 3,150 feet and 25 acres
Petroleum Products	4,200 feet waterfront	5,163 feet waterfront	0 Except for new refineries	Calumet District
Miscellaneous	18,330 feet waterfront 170 acres land	0	18,330 feet waterfront 170 acres land	Chicago River—1,500 feet and 15 acres Calumet District—16,830 feet and 155 acres Near Joliet—indefinite requirements
Total			39,680 feet waterfront 710 acres land 14,900,000 bushels elevator capacity	

Grouping the foregoing additional requirements by location and type of vessel service the following shows what should be supplied in the Chicago Region to meet the demands of the future:

Requirements	Chicago River		Calumet District		Michigan City
	Barges	Ships	Barges	Ships	Ships
Feet of waterfront	5 500	0	8,250	24,430	1,500
Acres of waterfront industrial sites	50	0	80	555	25
Elevator storage capacity, bushels	0	0	0	14,900,000	0

CHICAGO RIVER BARGE TERMINALS

On the Chicago River the necessary frontage for the service of barges may all be found in the so called "Lumber District" near South Ashland Avenue. However, if there is a tendency for the traffic to decentralize there are several other locations along the North and South Branches, as well as along the Chicago Drainage Canal, which might be availed of as required.

THE USE OF CALUMET RIVER

The Calumet River has considerable unused waterfront and acreage and in these respects could largely meet the requirements for the Calumet District. The limit of capacity is to be found in the channel, however, for there are bridges to be contended with and also a crooked channel.

Reserve capacities of existing installations and new ones actually under way will more than double the vessel movement on the Calumet River.

This would result in a greater number of arrivals and departures at the Calumet River terminals than there are now on the Chicago River. There are now 14 bridges over the Calumet River; the next 20 or 30 years will probably witness an increase in this number sufficient to make the stream a difficult one to navigate, particularly with an increase in the volume of water-borne commerce. The reasonable capacity of this stream as a channel between river terminals and Lake Michigan will be reached before most of the unused waterfront is utilized. Widening and straightening would ameliorate conditions, but the bridge interference would still exist.

LAKE CALUMET BARGE HARBOR

It is unsafe to look to the Calumet River for terminal facilities for lake vessels in addition to those to be provided in the normal expansion of existing establishments. It is, therefore, not proper to consider Lake Calumet as a future terminal for lake ships, since the capacity of the stream to pass the ships will be entirely utilized before the waterfront capacity of tracts along the river itself is exhausted and a demand created for sites in Lake Calumet.

Since the capacity of the Calumet River is in question it would be unwise to increase the vessel movement by locating industrial barge terminal facilities on it if other sites are available. To meet the estimated requirements for barges 8250 feet of water front and 80 acres of land are needed.

The Van Vlissingen plan for the improvement of Lake Calumet would provide 1451 acres of land, 693 acres of water area, and about 70,000 feet of water front if entirely completed as planned. The land is to be provided by dredging the slips and anchorage basin to a depth of 22 feet. A harbor belt railroad is to encircle the lake, serving all portions of the water front, and to which direct connections can be made by the Pullman Railroad, the New York, Chicago and St. Louis Railroad, the Chicago and Western Indiana Railroad, the Indiana Harbor Belt Railroad and possibly a few others.

This project would answer all requirements in the way of water front sites for industries desiring to utilize either lighters or barge service over the Lakes-to-the-Gulf Waterway for almost an indefinite period. The ratio of land to water area is apparently satisfactory, but there may be a deficiency in total water front as compared to land area. However, slips may be added later on if ever necessary.

As far as the use of this harbor by barges and lighters is concerned there is no need of providing a depth of water of 22 feet. Fifteen feet of depth would be ample. However, the greater depth results in more material for filling purposes and is, therefore, a proper charge against the cost of the reclaimed land.

The railroad classification yards provided in Wolf Lake for the service of the Calumet Interstate Har-

bor on the lake front are near enough the Lake Calumet development to serve a similar purpose for railroad traffic from the latter source. Contact with these roads would be made over the lines of the Calumet Western Railroad and the Chicago and Western Indiana Railroad.

INDIANA HARBOR CANAL

The Indiana Harbor Canal has an unused water front capacity of over 30,000,000 tons per year as regards wharf space, but perhaps not more than 10,000,000 to 15,000,000 tons as regards industrial sites. The addition of even the smaller tonnage might require a widening of the channel and the reconstruction of all of the bridges. The widening of the channel would not be difficult as a large portion of the water front property is undeveloped. A greater width than 200 feet would not be necessary if ships were berthed in slips leading off the channels, but even with such an arrangement the channel would be highly congested by the time all of the water front areas were fully developed.

The Indiana Harbor Canal might accommodate the tonnage required by the Jones & Laughlin site and the four oil refineries, and also take care of perhaps three to four million tons in addition for other industries. It cannot be counted upon for much more.

Of the total requirements in the way of industrial terminal facilities for ships the Indiana Harbor Canal could provide 200 acres of water front sites and 8000 feet of wharfage.

WOLF LAKE DISTRICT

In addition to sites for new oil refineries, there would remain to be supplied in the Calumet District 355 acres of land, 16,430 feet of water front, and 14,900,000 bushels of elevator storage capacity, after the Calumet River and Indiana Harbor developments had been used to capacity. Wolf Lake and the Lake Michigan front between the mouth of the Calumet River and Indiana Harbor are the remaining locations to be considered.

Wolf Lake and the lands adjoining it afford all that is to be desired in the way of area, frontage, and rail connections. It is close to Lake Michigan so that a short straight connecting channel can be provided. There is only one objection to its development, and that is the existence of three main railroad lines, one belt railroad, and an important highway in the narrow strip of land now between Wolf Lake and Lake Michigan.

The cost of either tunneling or raising these land routes appears to be greater than the difference between the cost of reclaiming lands from Lake Michigan and the cost of Wolf Lake property. The conclusion, therefore, favors the use of Wolf Lake and its immediate vicinity for harbor railroad yards, and perhaps for refineries which can make pipe line contacts with piers on the lake front, and the building of all the other harbor facilities on lands reclaimed from Lake Michigan.

The unoccupied lake front between the property of the State Line Generating Company and the old entrance to Wolf Lake should be the first to be developed.

About 3000 feet of unoccupied lake frontage are available for improvement at this location, and to utilize this limited area to best advantage the development should be at right angles to the shore. Lands for industrial sites would be provided by filling in the lake, preferably in large tracts as the industries to be served require considerable area.

The plan proposed contemplates the reclamation of about 450 acres of land separated into sections of about 75 acres apiece by slips 2400 feet long. In addition to a group of storage tracks to the south of these areas this industrial harbor development may utilize the large classification yards provided in Wolf Lake for the service of the commercial piers to the north of the industrial harbor.

Should the capacity of this improvement be exhausted a similar arrangement could be provided opposite the present shore of Lake Michigan southeast of Hammond's lake front park.

LAKE JOLIET BARGE HARBOR

Reference has been made previously to the need for a basin in the vicinity of Joliet for making and breaking fleets of barges. It has also been pointed out that when the through barge-to-rail traffic reached sufficient volume an interchange terminal in the same general location, with connection to the Elgin, Joliet and Eastern Railway, would be desirable.

Consideration of several possible locations along the Drainage Canal and Des Plaines River leads to the conclusion that Lake Joliet, the enlargement of the Des Plaines River three miles below the City of Joliet, answers all requirements to best advantage. This location offers ample water area free of cost except for dredging in isolated places; for interchange business it saves one lockage as against a

Lake Calumet Industrial Barge Harbor

location between the Brandon Road Dam and the end of the Chicago Drainage Canal, and two lockages as against locations on the Drainage Canal. Direct rail connection is available with the Elgin, Joliet and Eastern Railway. In addition there is ample space along the banks for industrial sites should there be a demand for this type of facility.

The other locations considered are either lacking in space for storage and maneuvering of barges, or in suitable railroad connections, or also involve too great an outlay in initial capital expenditures for structures necessary to form anchorage basins.

OTHER IMPROVEMENTS

The industries at Gary Harbor and on the Indiana Harbor Canal do not have direct access to the Lakes-to-the-Gulf Waterway, as there is no navigable interior channel to the Calumet River and the movement of river barges through the open lake is unsafe. These industries, therefore, will be required to lighter, switch, or truck their goods to and from barge terminals on the Calumet River and in Lake Calumet.

It would be advantageous to existing industries to have an interior waterway connection, and the use of unoccupied waterfront lands in the section affected would be stimulated.

This could be brought about by the widening and deepening of the Grand Calumet River between its confluence with the Little Calumet and its junction with the Indiana Harbor Canal, and the subsequent extension of this improvement to Gary. At one time it was proposed to improve this portion of the stream for the use of ships and an Act of Congress was passed in 1902 authorizing the Secretary of War to receive deeds to the right of way for a rectified channel with a least width of 200 feet. Since there never has been a real demand for that type of improvement the government has not acquired the right of way, though it is understood that property owners on the Illinois section have signed agreements to deed the lands affected.

The Calumet-Sag Channel which connects the main drainage canal with the Little Calumet River near Blue Island has a bottom width in earth section of 36 feet, and a minimum width in rock section of 60 feet. While this width is ample to start with, traffic exceeding about 2,000,000 tons per year will find the channel too small, and its ultimate widening will be a necessity. For this reason no encroachments nor permanent structures should be permitted to interfere with such widening.

The bridges over this channel are all fixed structures with a clear headroom of 16½ feet. This is ample for bulk commodity traffic, but foreseeing the ultimate establishment of commercial traffic in the Calumet Region all new bridges over this channel and over the Little Calumet between Blue Island and Lake Calumet, should provide at least 21 feet of headroom.

SUMMARY OF GENERAL PLAN

The general plan for industrial and bulk interchange harbor facilities for the Chicago Region therefore involves:

Ships:

- Utilization of unoccupied or reserve locations on the Calumet River and Indiana Harbor Canal as long as channel capacity permits.
- Construction of lake front industrial harbor near the former entrance to Wolf Lake.
- Provision of rail-lake interchange facilities for coal at Michigan City.

Barges:

- Utilization of unoccupied or reserve locations on the Chicago River.
- Improvement of Lake Calumet as an industrial harbor.
- Widening, deepening and straightening of Grand Calumet River from Lake Calumet to Gary.
- Widening of the Calumet-Sag Channel for its entire length.
- Provision of barge-rail interchange facilities at Joliet.

EARLY REQUIREMENTS

In addition to a general plan as a guide for present and future development the early requirements of the water terminal situation in the Chicago Region might be summed up in the following statement:

(1) Improvement of local terminal service for lake package freight and passenger carriers.
(2) Initiation of projects intended to serve the Lakes-to-the-Gulf Waterway.
(3) Acquisition of essential tracts of land.

(1) LAKE TERMINALS

Freight Tunnels. The freight tunnels of the Chicago Tunnel Company are now as far east as Illinois Street and Peshtigo Court. An extension of not to exceed 1800 feet would bring this system to both sides of the Municipal Pier at places suitable for the construction of one or more elevator shafts from the tunnel to the floors of the pier. Both floors of the pier should be served and arrangements made for running the cars the full length of each pier shed.

Convenient and reasonable transfer service for all L. C. L. railroad interchange would be provided, as well as for a considerable quantity of downtown business.

The expense involved could be divided between the Chicago Tunnel Company and the Municipal Pier administration, the former paying for the tunnels, the latter for shafts, elevators, and house tracks.

Auxiliary Breakwater. Vessels berthed on the north side of the Municipal Pier are subject to considerable disturbance from wave action generated in the anchorage basin of nearly a mile in width between the pier and the government breakwater. An auxiliary breakwater has been built, parallel with and 450 feet to the north of the pier, for a length of about 1550 feet, which protects the vessels at the inner end of the pier. This breakwater should be extended about 800 feet in order to give complete protection to the entire north side.

Rail Service. To provide an immediate substitute for rail-lake interchange terminals now in service on the Chicago River an extension of the Chicago and Northwestern Railroad to the Municipal Pier is believed advisable. This work can be done in advance of construction of the storage yard to the south of the Pier.

The railroad tracks at the Municipal Pier will have to be located, temporarily at least, in the center driveway, on the north side against the platform, as the present arrangement of tenants is such that a track on the south side would result in serious interference with trucking operations. On the north side the use is not so intensive but that a section of the pier could be used for rail-lake carload interchange operations without affecting present uses materially.

At present, street cars serving the recreational features at the outer end of the pier utilize the lower driveway between the sheds. They interfere with the full use of the trucking platforms, and also with the installation of the proposed railroad tracks. Originally these cars used an incline to a track on the upper level. The resumption of use of this upper track is a simple operation and should be carried out.

Ultimately it may be necessary to widen the aprons or platforms outside the pier sheds to permit the construction of two tracks the entire length of the pier, though the drawing shows those tracks located in the center driveway. This change would not be required however until the railroad interchange business has grown to such an extent as to congest the facilities proposed on the south side of the river.

The Illinois Central Railroad connection may be obtained in the first instance by means of a car float operating between the end of the team tracks north of Randolph Street and the eastern end of the storage yard. This arrangement is not a permanent solution, but may be utilized until the harbor bridge, between the north and south sides of the mouth of the Chicago River, is constructed.

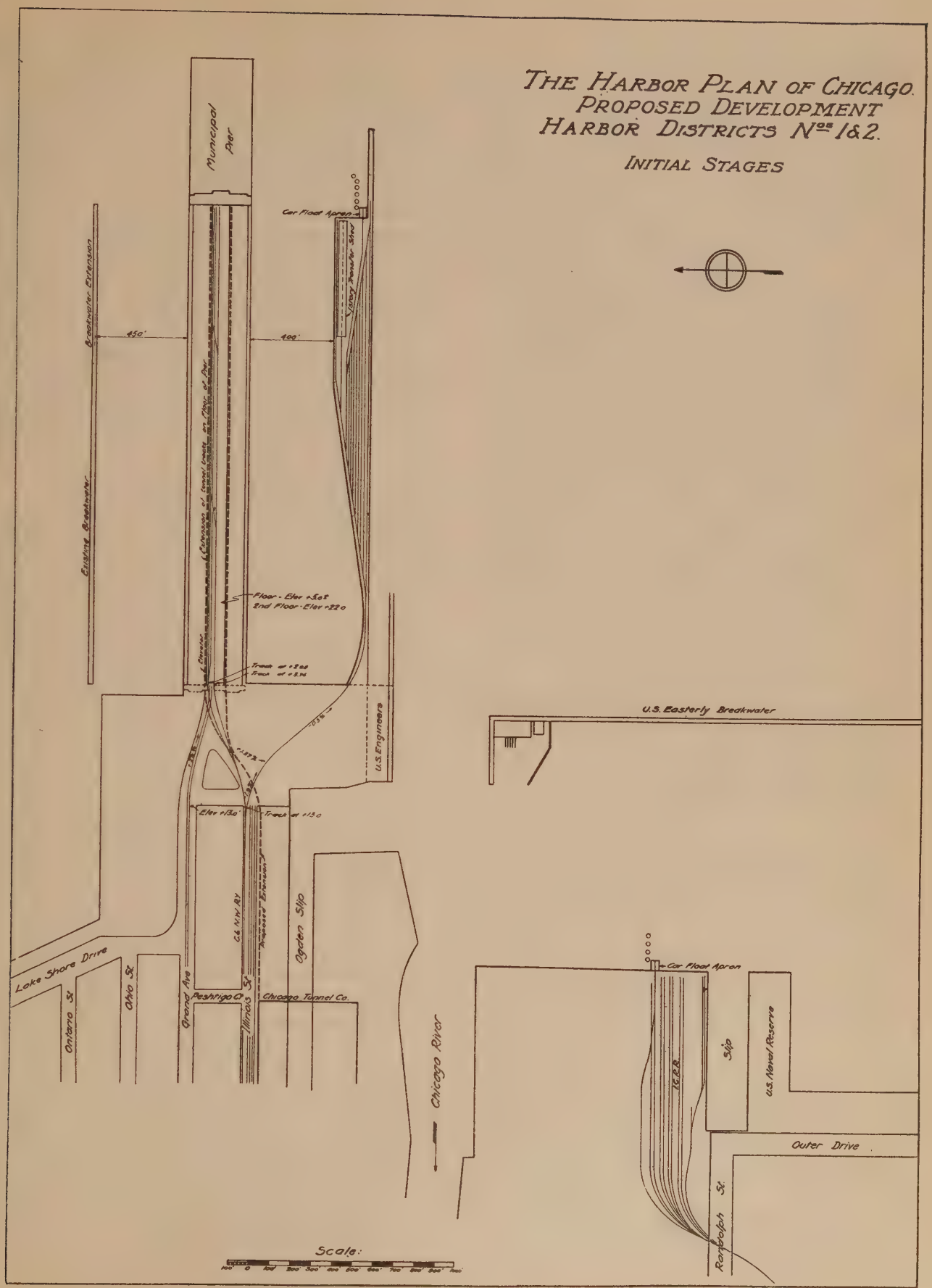
Grain Transfer. A number of vessels in the package freight business on the Great Lakes are arranged to permit carrying partial cargoes of grain. A few of these are engaged in traffic in and out of the port of Chicago, and more would be, were it not for the difficulty of reaching the elevators on the Chicago River.

Direct delivery of grain to these vessels at the lake front would not only remove this traffic from the river and to a certain extent relieve the bridge delays to land traffic, but would also attract more ships to the port and thus stimulate trade.

A lake front elevator is neither necessary nor desirable. From existing river elevators grain could be lightered alongside the vessels at the Municipal Pier and transferred to them while taking on other cargo. A floating marine leg would do the transferring from lighter to ship; one would be sufficient at the start and more could be added as required.

The cost of the transfer equipment would be a proper charge against the port authority, for the advantage to the city by way of decreased operation of bridges and consequent delays to land traffic would more than offset the expense of providing and operating this equipment.

The cost of lightering the grain from the elevators to ship-side should be absorbed by the ship.


THE HARBOR PLAN OF CHICAGO.
PROPOSED DEVELOPMENT
HARBOR DISTRICTS Nos 1 & 2.
INITIAL STAGES
Municipal Pier
Car Float Apron
Breakwater Extension
Existing Breakwater
450'
100'
Floor - Elev +5.0 ft
2nd Floor - Elev +22.0
U.S. Engineers
U.S. Easterly Breakwater
Elev +13.0'
Track at +13.0
Lake Shore Drive
Ontario St
Ohio St
Grand Ave
Peshtigo Ct
Illinois St
Chicago Tunnel Co.
Ogden Slip
Chicago River
Car Float Apron
I.C.R.R.
Slip
U.S. Naval Reserve
Outer Drive
Randolph St
Scale:

It would be less than the cost to the ship of entering the river and proceeding direct to an elevator.

Cargo Handling. Most lake package freight vessels handle their cargo through side hatches, an arrangement which is not favorable to the use of mechanical handling. Furthermore, the goods are not packed to withstand heavy handling, and the breakage resulting from the use of mechanical equipment would more than offset any advantage of more rapid movement. For these reasons it is not believed that the installation of cranes or similar equipment at the commercial lake terminals is justified as long as the commerce is purely internal. When an outlet to the sea is available and vessels and cargo more adapted to mechanical service enter the trade intensive use of the two piers in Chicago Harbor may justify the installation of gantry cranes of a size and capacity suited to the traffic.

(2) BARGE TERMINALS

Since one of the basic assumptions of this investigation is that the Lakes-to-the-Gulf Waterway will be completed in five years' time, early action is desirable with reference to the provision of the requisite terminal facilities.

Crawford Avenue Barge Terminal. The channels connecting the anchorage basin with the Chicago Drainage Canal intersect the right of way of the Atchison, Topeka and Santa Fe Railway at three places. It is proposed to build fixed bridges with 21 feet of headroom, where this railroad crosses the connecting channels.

Where the Belt Railway of Chicago crosses the other two railroads a short distance east of Cicero Avenue, it will be necessary to raise the grades of all three lines about four feet so that the headroom of 21 feet will be available under the bridges over the channel to the anchorage basin. At the other crossings of the connecting channels only the Santa Fe Railway is involved. Since suitable access to the anchorage basin depends upon the raising of these lines an agreement should be entered into at once to permit this change to be made.

It is understood that the plans for extending Cicero Avenue over the Drainage Canal also contemplate the raising of these lines. The changes required for the extension of Cicero Avenue may take care of part of the requirements as to headroom under the bridges. At any rate it is desirable that this raising be arranged for at once.

While the construction of the anchorage basin will not be one of the early steps in the development of the barge terminal, it would be desirable to acquire rights of way for the connections from the Drainage Canal as soon as possible.

The best location for the first unit of the barge terminal is just east of Crawford Avenue, as this location is accessible to the most important railroad connection (the Belt Railway of Chicago) and also nearest the most important through street. The work to be undertaken includes:

Widening of the Canal to 320 feet between the Illinois Northern Railway bridge and that at Crawford Avenue. This will provide the additional width necessary to permit mooring of barges at the wharf, and also some room for storage of barges awaiting wharf service.

Construction of a transit shed 500 feet in length near the eastern end of the widened canal section.

Construction of a ramp for street connection between Crawford Avenue and the transit shed.

Construction of track along the terminal property southwest to connect with the Belt Railway of Chicago.

The transit shed recommended for the initial unit is a two story structure 500 feet long by 65 feet wide. It has an apron on the canal side 20 feet wide with one railroad track depressed so that the floors of the cars will be on the same level as the floor of the shed. On the side opposite the canal is a 12 foot platform with a canopy to protect goods in transfer between car and shed. Three tracks parallel this inner platform.

Both longitudinal walls of the shed on the first floor and on the canal side on the second floor should be provided with practically continuous doors of the rolling or vertical lift type. Landing platforms are suggested for the second floor on the canal side. Arrangements should be made for bridging the track recess in the platform on the canal side; movable runways are the simplest device for this purpose.

Two semi-portal gantry cranes, each with a capacity of 1½ tons, should be provided for the first 500 feet of shed, and in about the same ratio for future extensions. These will be useful in transferring heavy baled articles and other cargo between barge and shed.

A gantry crane with a lifting capacity of at least 10 tons at a radius of 60 feet will be required for

transferring heavy loads directly between cars and barges. This should operate preferably at the west end of the 500 foot shed where two water side tracks are provided for this purpose.

Grand Calumet River. The five and a half miles of the Grand Calumet River between its confluence with the Little Calumet and its junction with the Indiana Harbor Canal, should be improved for barge transportation as soon as all preliminaries can be arranged. The transfer of the right of way to the United States and the authorization of the project by Congress are involved.

There are now eleven bridges over this portion of the Grand Calumet River; only one is a fixed bridge, though the draw spans of the other ten are not operated at present. None of these structures has sufficient headroom when closed to pass tug and barge traffic, but it is not believed that the raising of any one of them so as to give sufficient headroom would be diffcult if the openings of the draw came too frequently for land traffic.

If the necessary right of way is made available for this project, the government might be interested to the extent of assuming the construction and maintenance costs.

Lake Calumet Barge Harbor. The initial development of this harbor along the lines laid down in the original Van Vlissingen Plan was provided for in a contract ordinance passed by the City Council a few years ago. This ordinance was in the nature of an agreement with the New York, Chicago and St. Louis Railroad ("Nickel Plate") by which the City of Chicago was to deed certain submerged harbor lands and grant the exclusive ownership and operation of the Harbor Belt Railroad to the "Nickel Plate" in exchange for the dredging of a central channel the entire length of the lake. Legislative authority for these grants was given by an act of the State Assembly in 1921.

The merit of this arrangement with the New York, Chicago and St. Louis Railroad lay in the fact that the city would be able to have the entrance channel provided at a comparatively small expenditure of funds as well as to insure that some form of railroad service would be furnished to all parts of the harbor. The principal defect lay in granting to one railroad line the exclusive ownership and control of the harbor belt railroad instead of providing for its use by all railroads under equal terms as far as the belt line itself was concerned. However, the plan offered a solution and appeared to be a more practical expedient than any other suggested.

By an act of the 1927 State Legislature the enabling Lake Calumet Harbor Act of 1921 was repealed. As the Nickel Plate Ordinance was based upon the Act of 1921 it is possible that the city is a party to a contract, the terms of which it cannot fulfill. At any rate, the situation as to the entire program of development is changed, so it is probable that alternate schemes of improvement may be considered without placing the city in diffculties with the Nickel Plate Railroad or with the State Division of Waterways. Furthermore the City of Chicago now appears to have legislative authority to finance the project independently of other civic projects.

Accordingly it is proposed herein to undertake the project somewhat differently.

The first development in the industrial barge terminal in Lake Calumet would apply to only that portion of the harbor in the southeast end of the lake, immediately north of the entrance. The excavation of material from the entrance channel would be the first operation, the material to be deposited along the right of way of the harbor belt railroad and of the marginal street, from the entrance to the lake north for a distance of about 5700 feet. Only sufficient material to construct the fill for the railroad and street should be dredged by the city, the balance of the dredging and filling to be done by the industries locating there.

Following this, the first unit of the harbor belt railroad and marginal street should be constructed —a single track railroad and a 40 foot pavement being ample at the beginning. From the northern end of this piece of track an extension should be made to the east which will connect with the Chicago and Western Indiana Railroad, and Calumet Western Railway, over which the Belt Railway of Chicago and the Indiana Harbor Belt Railroad, respectively, have operating rights.

Negotiations should be entered into with these railroads with a view to having the connection built at their expense in exchange for the privilege of operating over the harbor belt railroad to and from water front industries. This operating right over the harbor belt should not be exclusive as similar arrangements should be made with other railroads as the business grows and additional connections are necessary.

As far as the City of Chicago is concerned the only expense it should be put to would be the cost of the section of the harbor belt railroad and of the necessary street approaches. Dredging, filling and bulkheading should be done by lessors or purchasers. These expenses to the city for the first unit have been estimated to be about $400,000.

Should it be necessary for the City to build the connecting railroad as well, the cost to the City would be increased by about $800,000.

In leasing the harbor property opposite the harbor belt railroad, the lessee should be required to confine such excavation as may be necessary to a channel 450 feet wide from the entrance to the northern end of the first unit and to the slips. Dredging should be carried to a depth of 22 feet.

Approximately 8200 feet of water front and 153 acres of land are involved in the first development.

Units may be added towards the north merely by extending the harbor belt railroad and marginal street. To the south the construction of a bridge is involved, so operations in this direction may be delayed for some time. However industries whose railroad service could be supplied by the Pullman Railroad could be accommodated there now.

ACQUISITION OF THE TRACTS OF LAND ESSENTIAL TO ULTIMATE DEVELOPMENTS

The key locations for the improvement of the Interstate Harbor near Wolf Lake are the 1500 feet of lake front property immediately southeast of the state line, and the 3000 feet of lake front park at Hammond. While it might be desirable to acquire the property in Wolf Lake necessary for railroad yard purposes as well, there is such an abundance of unoccupied property there, including even the bed of the lake which might be reclaimed for this purpose, that there appears to be no pressing need of such action at present.

The right of way for the proposed railroad connections between both the commercial and industrial sections of the port and for the Wolf Lake harbor yards, however, should be acquired before any developments along the intervening property proceed far enough to make the cost of the right of way excessive.

CONSTRUCTION PROGRAM

CHICAGO HARBOR

A logical initial project in the execution of the general program for the improvement of facilities at Chicago Harbor would include the following:

Construction of car storage yard and transfer platform on north side of entrance to Chicago River.

Construction of tracks on north side of center roadway at Municipal Pier, including removal of street car tracks to upper level.

Construction of direct rail connections to Chicago and Northwestern Railway tracks on Illinois Street.

Provision of car float service between car storage yard and Illinois Central..... $125,000

Provision of connection with Chicago Tunnel Company's System (shafts, elevators and pier service only)..... 136,000

Completion of protecting breakwater on north side of Municipal Pier..... 80,000

The first three items are so inter-related as to make it necessary to combine units in estimating.

The estimated cost of these three operations combined is about $1,250,000. The cost of all operations included in this project, allowing 10 per cent for contingencies, 3 per cent for engineering, and 2½ per cent for interest during construction, is about $1,800,000.

A second project would involve the provision of 1000 feet of double story pier on the south side of the entrance to the Chicago River with the necessary street and rail facilities, direct connection with the tracks of the Illinois Central Railroad being made north of Randolph Street. The cost of this project is estimated to be about $3,200,000.

The first and second projects could be reversed in order, if it were desired to substitute a development having a direct connection with the Illinois Central Railroad for one with a connection through a car float. In such event, however, it would be best to provide a Chicago Tunnel Company connection at the Municipal Pier, which would increase the cost of the first project to about $3,350,000,

and reduce the cost of the second project to about $1,650,000. The annual cost of operation of the car float is estimated to be $80,000 which about offsets the difference in investment costs.

There are, therefore, to be considered: on the one hand, 2300 feet of pier on the north side of the river provided with tunnel service and rail connection to both the Chicago and Northwestern Railway and the Illinois Central Railroad, with 600 feet of transfer shed in addition; and on the other hand, the 2300 feet of pier north of the river, with no rail connection, together with 1000 feet of new pier on the south side of the river having connection with the Illinois Central Railroad only and also a tunnel connection. As both developments cost about the same to carry, decision should favor the improvement on the north side first.

The extension of this south side pier to the east and the construction of the railroad connection across the Chicago River would take place when the traffic justified the additional expense. As there are many contingencies involved, estimates of costs at the present time would be of little value.

CRAWFORD AVENUE BARGE TERMINAL

In the original installation of the first development of the Crawford Avenue Barge Terminal, the Belt Railway connection east of its main tracks will be placed north of its final location as far as the foot of the 1.0 per cent approach grade. This will avoid the necessity of constructing any retaining wall to start with, will reduce the first cost of grading, and will locate the track out of the way of the construction of the necessary retaining wall when such wall is required. This will not only reduce the first cost, but will also cause very little excess cost over installing the wall and the track in its final location.

The estimated cost with a 500 foot shed, is:

Excavation		
Channel Excavation from I. N. Ry. to Crawford Ave.		$ 133,300
Excavation for transit shed		75,000
Excavation for foundation for street approach to Crawford Ave.		14,300
Excavation from improved site which is placed in A. T. & S. F. connection		6,500
Excavation for main track used in fill for main track		4,200
Excavation from improved site which is placed in street approach		10,200
Excavation and borrow from spoil bank to make grade for Belt Ry. connection		6,300
Total Cost of Excavation		$ 249,800
Bulkhead—800 lineal feet of bulkhead @ $120.00		96,000
Concrete Retaining Walls		
East of Crawford Ave., between Harbor R. R. & A. T. & S. F. Ry.	2,500	
For street approach to Crawford Ave.	14,000	
Total 16,500 cubic yards @ $13		214,500
Street Paving — Granite Block — 12,000 square yards @ $7.75		93,000
Tracks—12,200 lineal feet of track @ $4.60		56,100
Transit Shed and Platforms		
Transit Shed—65'x500'		200,000
Platforms—both sides		12,000
Cranes		
(1 heavy full portal 10-ton gantry @ $35,000)		
(2 semi-portal 3-ton gantries @ $25,000)		85,000
Electric Power Line from Lockport		
Change present 44,000 volt line on 60 ft. steel towers from present location to just north of south right of way line of I & M Canal for entire distance of about 5 miles west from east of Central Park Ave. (I. M. Ry.) to west of 56th Ave. to place it out of the way of future development		100,000
		$1,106,400
Contingencies—10%		110,600
		$1,217,000
Engineering—3%		36,500
		$1,253,500
Interest during construction 1 yr. @ 5% on ½ cost—2½%		31,308
Total for 500' shed development		$1,284,800

The first extension to this original unit would be a 650 foot addition to the shed to the northeast, pavement and tracks to be extended in the same direction as well. Additional units would then be

added, as required, to the southwest. The cut through to the anchorage basin and the excavation of the basin itself would be made when congestion in the widened channel becomes too great.

LAKE CALUMET HARBOR

The first step would be the construction of the harbor belt railroad and the marginal street for the length of the first unit. Only enough fill would be placed to start with for a single track railroad and a granite block pavement 40 feet wide. Costs are estimated as follows:

Dredging and fill—367,000 cubic yards @ 40c	$146,800.00
Surfacing—19,300 square yards @ 25c	4,800.00
Paving—23,100 square yards @ $7.75	179,000.00
Track—5,700 feet @ $4.60	26,200.00
	$356,800.00
Contingencies, 10%	35,700.00
	$392,500.00
Engineering, 3%	11,800.00
	$404,300.00
Interest during construction—9 months @ 5% on ½ cost—1⅞%	7,600.00
Total	$411,900.00

It should be remembered that costs of filling in submerged lands, including the expense of bulkheading, are proposed to be carried by prospective lessees.

The material for filling purposes is to come from the established channel opposite the tracts which are to be reclaimed.

The cost of the railway between the harbor belt railroad and the Chicago and Western Indiana Railroad is estimated as follows:

Right of way	$150,000
Fill—136,500 cubic yards @ $1.75	238,900
Subways—11—(built for double track)	308,000
Track—5800 feet single line @ $4.60	26,700
	$723,600
Contingencies, 10%	72,400
	$796,000
Engineering, 3%	23,900
	$819,900
Interest during construction—9 months @ 5% on ½ cost—1⅞%	15,400
	$835,300

XI.

PORT ADMINISTRATION

PRESENT METHODS OF PORT MANAGEMENT AT CHICAGO

IN THE introduction to his book on "Port Administration and Operation" Dr. Brysson Cunningham, editor of the Dock and Harbour Authority, London, makes some general remarks which are peculiarly apt here:

> "All systems of port government are characterized by an attempt to meet local needs and requirements, and therefore embody certain features which are essentially good and beneficial. It will also be admitted that a number of systems exhibit obvious defects, which are undoubtedly open to criticism, if not to actual remedy; but a fair investigation will show that, in most instances, these are inherent in the conditions of the case, and that there are corresponding and countervailing advantages not to be lost sight of. So, while some ports prefer to be municipally governed, some to be autonomous, others to be proprietary; some to be individualistic, others to be the arena of competing interests; some to be polyarchies and others to be oligarchies; it may be said, in general, that each port has evolved its own system of government along lines which are most congenial to its nationality, its traditions, its genius and its bent. A well known proverb states that every nation gets the government it deserves. We may say that every port adopts the management it prefers."

The case of Chicago is held up in most treatises on the subject of port administration as an example where a multiplicity of jurisdiction seems to have been the choice of the people.

It may be stated in general, however, that the City of Chicago, through various agencies, exercises control over the waters adjacent to the city except insofar as its authority is curtailed by the supervisory powers of the State of Illinois and by the bridge-building, driveway-extending, or land reclaiming powers of certain other bodies.

The authority granted to the South Park Commissioners and to the Commissioners of Lincoln Park includes the power to extend the parks, boulevards, and bridges over submerged lands or navigable rivers bordering on such parks. The Park Boards also have power to release lands bordering on or penetrating into any public waters to the City for wharves, slips, docks, breakwaters, etc.

The Sanitary District of Chicago was formed pursuant to the terms of the act of May 29, 1889, and acts amendatory thereof. The powers granted therein are, of course, those considered sufficient and necessary to enable the District to dispose of the sewage and drainage of Chicago and environs. Included among such enabling powers are those of constructing, deepening, widening or straightening one or more main drainage channels, of building bridges thereover, and of constructing and controlling docks therein. Neither District nor Park Board, however, has any power over actual navigation nor the general traffic of watercraft. The city would be alone in this field were it not for the supervisory power of the State, which is exercised by the Department of Purchases and Construction.

This department was created by the act of June 2, 1925; its jurisdiction includes all powers formerly vested in the Canal Commissioners, the Rivers and Lakes Commission, the Illinois Waterway Commission, and the Department of Public Works and Buildings as the successor of the three first named bodies, which were abolished by said act.

As the successor of the Canal Commissioners, the Department has the control and management of the Illinois and Michigan Canal, including its feeders, basins and appurtenances and the power to prescribe reasonable rules and regulations in respect to all matters connected with the navigation and use of the said canal, to establish and collect toll charges, and, with the permission of the Federal Government, to change and improve the canal to provide terminal and harbor facilities.

As the successor of the Rivers and Lakes Commission, the Department has jurisdiction and supervision over all rivers and lakes of the State, and no work of any kind whatsoever in any of the public waters in the State may be done without the approval of the Department.

As far as Calumet Harbor is concerned, the Department must approve the lease of any of the lands granted to the City, and has the power to insist that the Harbor be maintained in accordance with the plans submitted.

It therefore appears that there are four active public bodies, independent municipal corporations with grants of power direct from the State, which have some authority over the use and occupation of public waters and submerged lands. These are the City of Chicago, the Lincoln Park Commissioners, the South Park Commissioners, and the Sanitary District of Chicago. While these rights and powers in public waters need not be extinguished, their exercise should not interfere with the execution of the plan of development of the port, and consequently, should be subject to the veto power of the port authority wherever a conflict is likely to occur. Otherwise the port plan will fail of accomplishment by reason of encroachments in areas most suitable for port development or because of other interference over which there is no control.

PORT ADMINISTRATIONS ELSEWHERE

It is clear that the port authority as a local organization for administrative purposes has received a recognized place in the American political scheme. Whether by sufferance, or for convenience, or by necessity, the Congress and its agencies have refrained from occupying the field of port control in several directions. Indeed, it might be said as a general proposition that port administration is largely in the hands of local authorities rather than under Federal control.

There are four important instances in this country of the direct form of State control of port affairs—Boston, Mobile, New Orleans and San Francisco. In Boston administration is through one of the departments of the government of the State of Massachusetts. In Mobile, New Orleans and San Francisco boards of Harbor Commissioners have been created by legislative enactments.

Indirect State control is, however, the general rule in the United States exercised through city governments or through municipalities or other local public corporations specially created by statute. There are, as previously stated, almost as many forms of organization and kinds of corporate powers as there are ports, so there is little to be gained by trying to classify them for the purposes of exposition and study. There has been, however, a general tendency in recent years in the direction of the establishment of regional jurisdictions, due to the acceptance of the theory that a port is more than a local affair.

RECOMMENDED JURISDICTION AND POWERS

The question of territorial jurisdiction precludes the four local bodies previously mentioned from assuming the role of port authority without statutory extension of powers as city, county and state boundary lines lie within the area over which the port development of the Chicago Region will be distributed in the course of time. While the Sanitary District might annex the additional areas in Illinois necessary to give the requisite territorial jurisdiction, such a procedure (for the purposes of port exploitation) might require legislative authority, and would involve the District in activities which are foreign to its purpose and interest.

The powers to be conferred by the State upon the port authority should be broad enough for it to function in its allotted field without too many restrictions to hamper the smooth and efficient conduct of business and yet in sufficient detail to insure a clear understanding of what it can and cannot do. It should be remembered that a municipal corporation, contrary to a State, has practically no implied powers and therefore considerable detail is necessary if a wide range of activities is to be covered.

Consideration of the powers and rights granted to existing port bodies in other places where the objects to be attained are similar, leads to the general conclusion that in the local case the jurisdiction established by the State should include the following authorities:

(1) To fix harbor lines and wharf or pierhead lines (sometimes in connection with harbor improvements).

(2) To acquire valuable property in excess of the actual requirements of authorized projects.

(3) To issue licenses or permits for water front construction.

(4) To regulate the anchorage and moorage of vessels.

(5) To acquire the necessary properties and rights and to construct and operate various water-terminal facilities.

(6) To provide terminal transportation services and fix the rates therefor.

(7) To operate warehouse and storage facilities as public warehousemen and fix the rates for the services performed.

(8) To operate a pilotage service.

(9) To buy and sell coal and other fuel and supplies for ships.

(10) To pass ordinances concerning the territory, jurisdiction and control of the port and conduct thereof.

(11) To levy taxes and issue bonds.

The situation at Chicago is different from that at most other ports in that the economic region of which the city is the focus includes parts of other states. Increased demand for port facilities may require the development of harbors in Wisconsin or Indiana.

Statutory authority to operate in another state therefore seems a desirable requisite in the present case. As all phases of the situations to be developed are not at all clear and are unlikely to be for some time, the grant of power from the State, with this end in view, necessarily must not be too detailed. A treaty between the adjoining states will be an essential step.

XII.

AIRPORTS

INTRODUCTORY

THE relation between airports and harbor developments ordinarily is not so intimate as to warrant their consideration jointly. As carriers of passengers and goods, airplanes are neither auxiliary nor competitive to ships so that the necessity of planning harbor works in such a manner as to focus transport agencies does not extend to the field of air transport.

At Chicago, however, it seems to be the opinion of many qualified to speak on the subject that the solution of Chicago's airport needs lies in a landing field on the lake front at a location fairly close to the business district. As such a solution would involve the preemption of areas available for harbors at the possible expense of plans for harbor development, it was felt in this case that there was sufficient relation between the two projects to justify the study of both in the preliminary investigation, as well as to warrant a brief presentation in this report of the requirements of the City in the way of airports and of suggestions as to how they should be met.

AIR TRANSPORT IN GENERAL

Previous to the World War commercial air transport was practically non-existent, though a small airship line had been organized in Germany and was struggling through the preliminary stages of developing a service connecting several of the more important cities of the empire.

The first venture in the field of air transport that ultimately proved to be a worthy one was the inauguration of the air mail service of the U. S. Post Office Department. The first route of that service was put in operation between Washington, D. C., and New York City on May 15, 1918. Shortly afterward numerous airplane services were started in all parts of the world, and while there now exist many efficient and extensive air transport organizations, no one of these has a record comparable with that of the U. S. Air Mail.

Many foreign countries have adopted a policy of subsidizing their air transport services, but this policy has never been considered favorably in this country, with the result that the so-called private commercial operations in Europe made much more rapid progress than those in America, with the exception of the government operated air mail. During the past year or so the U. S. Post Office Department has been withdrawing from the operating field in favor of contracting for service with private companies, so that the latter have been given a paying load on which to base their less secure operations in the passenger and express business. As a result, the years 1926 and 1927 have witnessed tremendous development in the operation of air transport facilities in the United States on a scale comparable to that of any other country in the world.

There are now fifteen American air-transport companies holding air mail contracts. The regularly operated routes, covered at least once daily, have a combined length of 10,000 miles, and as they are comparatively few in number, the most striking characteristic is their length. The New York-Chicago-Dallas route of the National Air Transport, for instance, is 1726 miles long, while Pacific Air Transport has a route of 1121 miles between Seattle and Los Angeles.

Traffic in the four leading countries in the world in the year April, 1925, to March 31, 1926, was as follows:

Country	Mileage Flown	Passengers Carried	Tons of Cargo
Germany	4,650,000	133,639	1,118.00
United States	4,593,947	5,782	1,545.00
France	2,928,447	19,768	2,000.00
Great Britain	865,000	14,675	456.00

Regular passenger service in the United States is still in its infancy, while it is the predominating factor in Germany. This is the result of several factors, principal among which are the comparatively brief existence of the scheduled private operations in this country, the relatively higher railroad fares

in Germany, and a greater sense of "air-mindedness" on the part of the average European business man. Time will rectify the first and last conditions adverse to passenger travel by air in this country, while experience and increased business along other lines, such as express and mail, may operate to decrease the large differential which now exists in America between air and rail rates.

At the beginning the proper field for air-transport was rather obscure. Many considered it as an encroachment upon the activities of the railroads. Others looked upon it only as an agency to be used in an emergency, or for advertising purposes, and truly enough it was little more than an experiment. It is rapidly making a field of its own however, and in the short space of less than ten years' time has developed into a tool of business of almost equal importance with others of long standing usefulness. As a result, manufacturers are able to maintain smaller stocks of expensive parts at remote assembly plants, for the reliability of present day air-transport makes quick deliveries of replacements possible. Banks send large checks by air mail for collection because of the interest savings. Numerous other instances of use of this new form of transportation might be cited, but they are all covered in the general statement that the field of operation seems to lie, in this country at least, in the rapid transit of passengers and of high-class goods (i. e., mail, securities, valuables, perishables and emergency supplies). Since goods of this order, as well as persons, are now being transported in large quantities and numbers at materially less speed than air-transport can provide, there is no question but that a large amount of important business is available and will be diverted to air as rapidly as the efficiency and reliability of this new mode of transport develops.

Accordingly it is a safe assumption that air transport is destined to become an important factor in modern commercial and industrial affairs, and for this reason means of facilitating its orderly development should receive serious consideration.

AIR TRAFFIC AT CHICAGO

The Chicago Association of Commerce quite recently made a very complete survey of the aviation situation at Chicago, particularly with regard to commercial air traffic. This survey showed, among other things, that the mileage of the air routes operated on regular schedules and centering at Chicago was greater than for any other city in the world. Reduced to a comparable basis the air route mileages centering at various large cities at the time of the survey was as follows:

Chicago	5937 miles
New York	5791
San Francisco	5449
Detroit	5423
Los Angeles	4990
Berlin	4170
Cairo	2536
London	1820
Paris	1752

The following statistics, also taken from the survey of the Chicago Association of Commerce, apply to scheduled commercial operations at Chicago only, and are of interest:

Number of commercial operators	5
Mileage flown yearly	3,170,003
Pounds of cargo	524,257

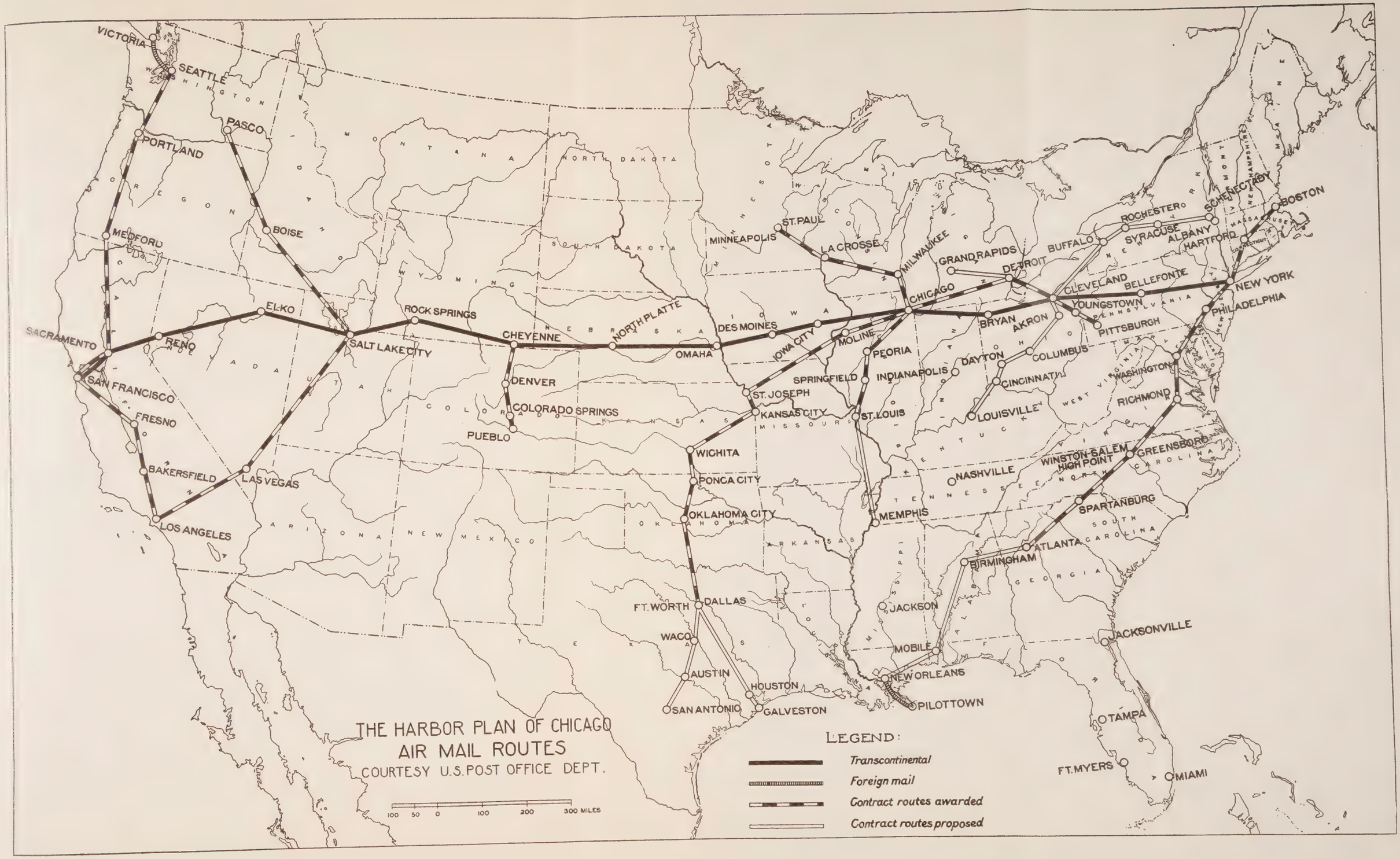
Air taxis and sport flyers are quite numerous at Chicago, some 61 operators being in the business. They handled 17,000 passengers, 640,000 pounds of cargo and flew 960,000 miles during the year 1926.

While the foregoing statistics do not appear to indicate that the air traffic at Chicago is large in the absolute sense, yet when consideration is given to the fact that relatively it is greater than for any other "air center" of importance, it is apparent that the situation merits attention. The business is growing rapidly locally as well as nationally, and another decade will witness an increase of traffic to a point where its importance may be vital.

The territory tributary to Chicago by regular air transport is illustrated by the accompanying map which shows the routes and principal ports of call of all regular lines in the country. Daily mail service is now handled over the following routes and by the companies indicated:

Chicago-San Francisco	Boeing Air Transport
Chicago-New York	National Air Transport
Chicago-Dallas	National Air Transport
Chicago-Minneapolis	Northwest Airways
Chicago-St. Louis	Robertson Aircraft Company
Chicago-Detroit	Ford Motor Company

The National Air Transport has recently inaugurated an express service between New York, Chi-


VICTORIA
SEATTLE
PORTLAND
PASCO
MEDFORD
BOISE
SACRAMENTO
RENO
ELKO
SALT LAKE CITY
ROCK SPRINGS
CHEYENNE
NORTH PLATTE
OMAHA
SAN FRANCISCO
FRESNO
BAKERSFIELD
LAS VEGAS
LOS ANGELES
DENVER
COLORADO SPRINGS
PUEBLO
MINNEAPOLIS
ST. PAUL
LA CROSSE
MILWAUKEE
CHICAGO
DES MOINES
IOWA CITY
MOLINE
PEORIA
ST. JOSEPH
KANSAS CITY
SPRINGFIELD
ST. LOUIS
WICHITA
PONCA CITY
OKLAHOMA CITY
FT. WORTH
DALLAS
WACO
AUSTIN
SAN ANTONIO
HOUSTON
GALVESTON
GRAND RAPIDS
DETROIT
BUFFALO
ROCHESTER
SYRACUSE
SCHENECTADY
ALBANY
BOSTON
HARTFORD
CLEVELAND
BELLEFONTE
NEW YORK
BRYAN
AKRON
YOUNGSTOWN
PITTSBURGH
PHILADELPHIA
DAYTON
COLUMBUS
INDIANAPOLIS
CINCINNATI
LOUISVILLE
WASHINGTON
RICHMOND
NASHVILLE
WINSTON-SALEM
HIGH POINT
GREENSBORO
MEMPHIS
SPARTANBURG
ATLANTA
BIRMINGHAM
JACKSON
MOBILE
NEW ORLEANS
PILOTTOWN
JACKSONVILLE
TAMPA
FT. MYERS
MIAMI
WASHINGTON
OREGON
IDAHO
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
NEBRASKA
IOWA
MINNESOTA
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
ARIZONA
NEW MEXICO
OKLAHOMA
ARKANSAS
TEXAS
LOUISIANA
MISSISSIPPI
TENNESSEE
KENTUCKY
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
VERMONT
NEW HAMPSHIRE
MAINE
MASSACHUSETTS
CONNECTICUT
SOUTH CAROLINA
NORTH CAROLINA
GEORGIA
FLORIDA
100 50 0 100 200 300 MILES
THE HARBOR PLAN OF CHICAGO
AIR MAIL ROUTES
COURTESY U.S. POST OFFICE DEPT.
LEGEND:
Transcontinental
Foreign mail
Contract routes awarded
Contract routes proposed

AIRCRAFT LANDING FIELDS AND PAVED HIGHWAYS IN THE REGION OF CHICAGO

IMPROVED FIELDS
TEMPORARY FIELDS
EMERGENCY FIELDS
PAVED HIGHWAYS

SCALE IN MILES

THE HARBOR PLAN OF CHICAGO

PREPARED BY
CHICAGO REGIONAL PLANNING ASSOCIATION
IN COOPERATION WITH
CHICAGO ASSOCIATION OF COMMERCE

KENOSHA
Bain Farm
WISCONSIN
ILLINOIS
WAUKEGAN
Proposed
Great Lakes
(Hydro)
MILWAUKEE AVE.
WAUKEGAN RD.
DUNDEE RD.
Wheeling
Pal-waukee
RAND RD.
HIGGINS RD.
Morton Grove
ELGIN
Heath
LAKE ST.
IRVING PARK BVD.
River Road
Cook Co. * 1
Chicago Flying Club
Eagle
MILWAUKEE AVE.
LINCOLN AV.
Lincoln Park
CHICAGO
WASHINGTON BVD.
ELMHURST
ROOSEVELT ROAD
Checkerboard
Maywood
Cook Co. * 2
MICHIGAN AVE.
Aurora
OGDEN AVE.
GARFIELD BVD.
Municipal
63RD ST.
Downers Grove
ARCHER RD.
AURORA
70TH ST.
Ashburn
10 MILE CIRCLE
JOLIET
111TH ST.
OCEAN AVE.
STATE ST.
Plainfield
147TH ST.
20 MILE CIRCLE
GARY
Mc Cool
Ford Terminal
JOLIET
LINCOLN HIGHWAY
CHICAGO HEIGHTS
Griffith
30 MILE CIRCLE
Cedar Lake
40 MILE CIRCLE
DIXIE HIGHWAY
ILLINOIS
INDIANA

cago and Dallas, carrying articles on a contract with the American Express Company. Passenger services also have been instituted by this line along the same route. The Boeing Air Transport now carries passengers on its Chicago-San Francisco route. These services are still in the experimental stage but bid fair to be successful.

EXISTING LANDING FIELDS AT CHICAGO

The survey of air transport facilities made by the Chicago Association of Commerce, referred to previously, covered the situation as to existing landing fields in the Chicago Region quite thoroughly. The following information has been extracted.

LANDING FIELD FACILITIES IN THE CHICAGO DISTRICT

Name of Field	Kind	Location	Acreage	Hangars	Gas & Oil	Shops
		AIR SERVICE				
Cook County Forest Preserves	I	Irving Park Blvd. and Thatcher Road	120	One	Yes	Yes
Wheeling	T	Milwaukee Ave. Adjacent to Dam No. 1	40	—	—	—
Checkerboard	I	Desplaines River and Roosevelt Road	40	Two	Yes	Yes
Eagle Airport	I	One-half mile S. E. Hinkley, Ill.	35	One	Yes	Yes
River Road	T	River Road at Lawrence	50	—	—	—
Downers Grove	I	63rd and Woodlawn	40	One	Yes	Yes
Pal-Waukee Airport	I	Palatine Road and Milwaukee Ave.	45	One	Yes	Yes
Eagle Flying Field	I	Elmhurst, Ill.	350	—	Yes	—
Morton Grove	T	Dempster St. at Morton Grove	64	—	Yes	—
Ford Airways Terminal	I	One mile south Lansing, Ill.	240	One	Yes	Yes
Municipal Airport	I	Cicero-Central 59th-63rd	320	Seven	Yes	Yes
Chicago Flying Club Field	T	One-half mile East River Road-Irving Park Blvd.	40	—	Yes	—
Heath Airport	T	Touhy and River Roads	80	—	Yes	Yes
Ashburn	I	83rd St. and Cicero Ave.	573-T 67-I	Eight	Yes	Yes
Cook County Forest Preserves (National Guard)	E	1st Ave. to DesPlaines River, 22nd St. N. to Sanitary Dist. property	260	—	—	—
Plainfield	I	4½ miles N. E. of Plainfield	40	—	—	—
Cedar Lake, Ind.	T	1 mile West Cedar Lake on Federal Highway No. 41	14	—	—	—
		AIR TRANSPORT				
Aurora, Ill.	T	3 miles N. of Aurora near the Central States Fair and Exposition Park	40	—	—	—
McCool, Ind.	E	McCool, Ind.	40	—	—	—
LaPorte, Ind.	E	LaPorte, Ind.	40	—	—	—
Griffith, Ind.	E	Griffith, Ind.	40	—	—	—
		MILITARY				
Great Lakes		Hydro Great Lakes Naval Training Station	—	Two	Yes	—
Great Lakes (Proposed Field)		North End of Training Station	100	—	—	—

Note: I—Improved. T—Temporary. E—Emergency.

Plans of the Chicago Aero Commission call for a central landing field on the lake front to serve as a terminal with a series of outlying fields to serve as construction and repair depots, where hangars, shop facilities, and servicing will be available. The first of the series of these fields is now nearly completed, though it has been available for landing purposes for the past year. This field, located at 63rd and Cicero Avenue, will be one of the finest airports in the world. The cinder runway system, of which approximately one-half is now completed, will have a total length of 3½ miles of 100 feet and 150 feet width. Six large hangars are now completed on the field and others will be erected this year. The field is tile drained and boundary lights have been installed on the first unit of runways. A 7½ million candle power revolving beacon mounted on a tower has been provided for night flying. Four special five hundred million candle power lights have been purchased which will light up the entire 3½ miles of the runway system. Improvements have also been authorized which will beautify the field, giving it the qualities of a park. Complete service is now available to users of the field. Additional hangar

sites are also available and are being rented by the city to responsible parties at the rate of $250.00 per year. The area of each hangar site in the hangar zone is 120x200 feet.

Following is the runway system of the airport:

East and west, 5280x100 feet
North and south, 2640x100 feet
Northeast and southwest, 3300x150 feet
Northwest and southeast, 1650x150 feet
Northeast and southwest, 1650x150 feet
Total runway area, 2,227,000 square feet

In addition, Chicago has three more municipal fields which have been created during the past year. The Cook County Commissioners have provided a permanent field on the northwest side of Chicago, consisting of 120 acres. The Commissioners have also set aside 280 acres of the forest preserve district directly adjacent to the present government air mail field, Maywood, as a permanent field.

REQUIREMENTS OF SITUATION

Chicago has no airport of sufficient dimensions to handle existing types of airplanes and present traffic within an hour's trucking distance of the center of the City. The Municipal Field at 63rd Street and Cicero Avenue is the nearest improved field of consequence, and it is ten miles away. As a result a considerable portion of the time saved by the planes in transit is consumed in local collection and delivery of cargo and passengers.

If the fullest advantage is to be taken of the increased rate of travel of this new method of transportation, it is evident that every reasonable effort should be made to reduce the time lost between the business center and the airport. With water transportation, terminal service must be expeditious to permit the quick turn around of expensive carriers; with air transport time is also the controlling element, but it applies more correctly to the goods than to the carrier.

Chicago is in no worse a position than most other large cities when it comes to the location of airports with respect to business centers. The comparatively large acreages involved make it difficult to obtain central locations, regardless of price; and when the question arises of clearing partially occupied areas for the purpose, costs are found to be prohibitive.

An airport of medium size of 120 acres could not be acquired and constructed within half an hour's trucking distance from the business center of Chicago for less than $15,000,000; and to make the whole 120 acres effective for landing purposes it probably would be necessary to expend a large sum in addition for the removal of obstructive buildings on the outskirts, while the question of closing streets to through traffic over an area nearly one-half a mile square would be most serious. Complete costs would be considerably in excess of $100,000 an acre.

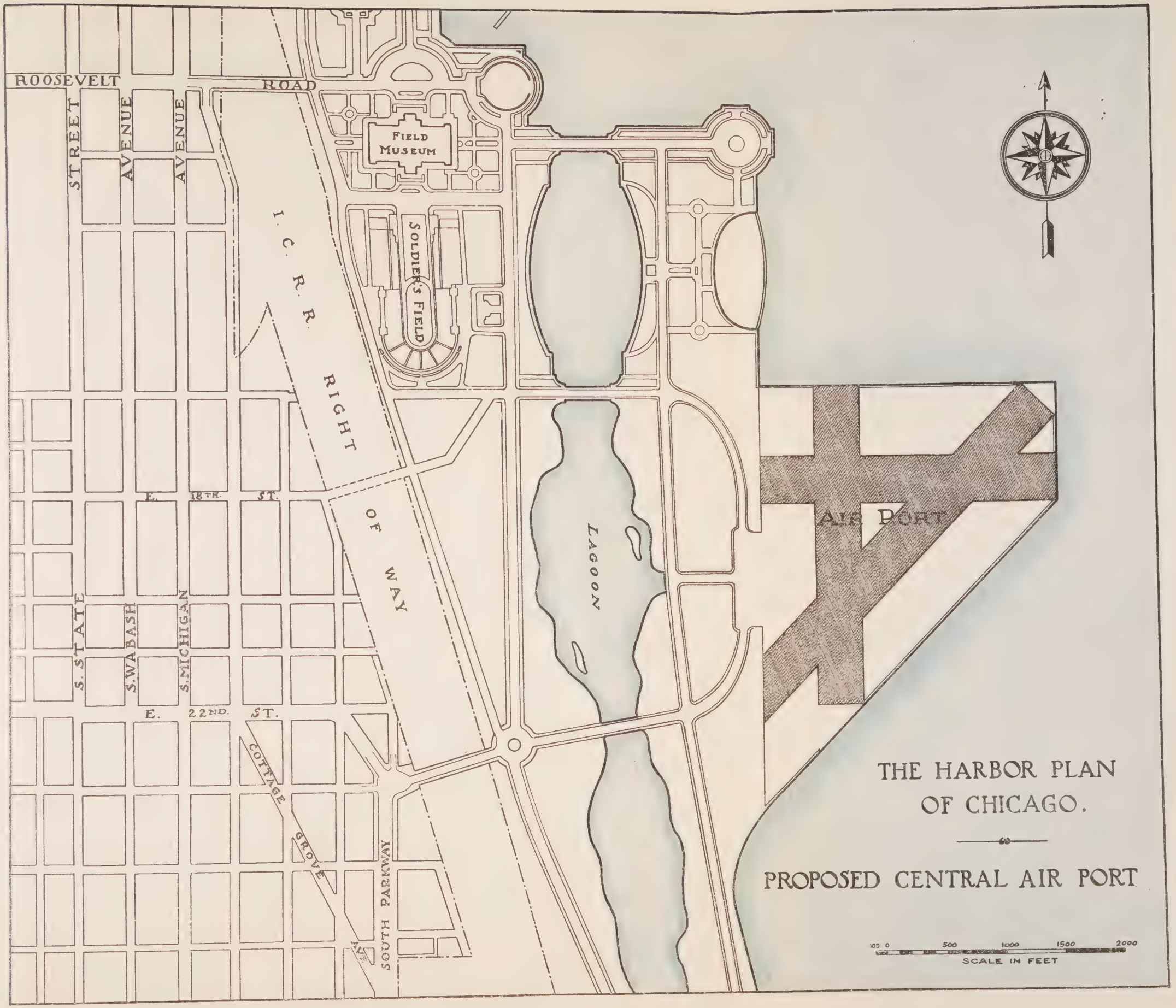
Chicago has an advantage over most other large cities in that it has a long stretch of frontage on Lake Michigan, along which it is practicable to reclaim submerged lands for a mile or more out into the lake, at costs varying from $25,000 to $50,000 an acre, depending upon the depth of the water.

As these sugmerged lands are the property of the State of Illinois they may be reclaimed for public use, hence an airport may be built along the lake, provided it can be so located as not to interfere with superior uses of the water front.

Outlying airports, which are capable of handling the business of the industrial districts and are within reasonable distance of the manufacturing establishments, are fairly well located and equipped. However, as business grows some means should be provided for the direct collection and delivery of cargo. A manufacturer should be able to make direct delivery of his shipments at the nearest field rather than have to send them to some central downtown office for later transfer to an outlying airport. If facilities are available to handle direct consignments at the airports, as well as means for rapid transfer of goods between airports, the need for a downtown landing field will be limited to the requirements of the business section alone, which comprise only a portion of the entire demand.

It is not necessary that the central airport have anything in the way of hangars or repair shops. Accommodations for arriving and departing passengers, and shelter for mail and express, will be required, but all facilities for the service of aircraft, aside from the fuelling stations, lighting arrangements and meteorological equipment, may be located at one or more outlying fields where ground space is available and not comparatively expensive.

The solution of the airport requirements in Chicago, therefore, seems to be in a field constructed along the lake front at a point convenient to the business district, where superior uses of the water front will not be interfered with, this field to be for


ROOSEVELT ROAD
STREET
AVENUE
AVENUE
FIELD MUSEUM
SOLDIER'S FIELD
I. C. R. R. RIGHT OF WAY
LAGOON
AIR PORT
E. 18TH. ST.
S. STATE
S. WABASH
S. MICHIGAN
E. 22ND. ST.
COTTAGE GROVE
SOUTH PARKWAY
THE HARBOR PLAN
OF CHICAGO.
PROPOSED CENTRAL AIR PORT
100 0 500 1000 1500 2000
SCALE IN FEET

the service of passengers and for cargo originating from or destined for the business district.

RECOMMENDED SOLUTION

The location recommended for Chicago's central airport is a mile east of Michigan Boulevard and immediately south of 16th Street extended. This is in Harbor District Number Three, and therefore the reclamation of submerged lands reserved for harbor purposes is involved. However, since the general plan of harbor development proposed herein does not contemplate the utilization of this area for water terminals at any time in the future, the suggested airport will not in any way interfere with the realization of that plan. The location is lakeward of the outermost part of the park development; it is not opposite any feature of the park system, such as bathing beaches, with which it might not harmonize.

At this location the depth of water varies from 6½ feet to 23 feet; the average depth is about 20 feet. No unusual engineering problems are therefore involved in reclaiming the submerged area.

The shape and extent of the airport are governed largely by the direction of the prevailing winds, which are from the southwest. In this direction a runway 3200 feet long is provided, and this length may be increased to 4000 feet by utilizing the space to the southwest. However, it would be better to plant this space in tough grass to serve as a final retard for planes overrunning the tracks.

An east-west runway 2600 feet long is provided, also a north-south runway 2700 feet long.

All runways are 400 feet in width, for landings are likely to be obscured by fog and smoke, and as much leeway should be afforded pilots as possible. It is proposed that these runways be properly drained, and planted in white clover.

Special attention should be paid to lighting this field; for the fog and smoke nuisance is a great factor, and unless partially overcome by lighting will restrict the usefulness of the airport.

The arrangements for fuelling planes, for the convenience of passengers, and for temporary shelter of cargo, are details beyond the scope of this report. No shops nor hangars are contemplated at this location.

The field will be approximately 120 acres in extent. It should not cost in excess of $6,000,000.